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No. 4991

In the

Supreme Court of the United States

OCTOBER TERM, 1965

OUTBOARD MARINE CORPORATION,

Petitioner,

vs.

DONALD A. HOLLEY,

Respondent.

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SEVENTH CIRCUIT

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Respondent.

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SEVENTH CIRCUIT

To the Honorable the Chief Justice and the Associate Justices of the United States Supreme Court:

Petitioner, Outboard Marine Corporation, prays that a Writ of Certiorari issue to review the judgment of the United States Court of Appeals for the Seventh Circuit in the above-entitled case. The opinion for which review is sought includes an astonishing ruling by the Court of Appeals on the validity of the single claim in suit. The opinion does not cite a single case. Neither does it discuss claim language. Neither does it correctly describe the prior art. The Court below has held valid a claim that reads verbatim on the device of one expired patent. In addition, the Court below has relied solely on an alleged distinction between a marine engine and an automobile

engine to justify its finding of validity over expired patents which disclose automobile engines otherwise responding identically to the claim language. Such action is, as a matter of law, clearly erroneous.

The opinion for which review is sought also holds that for the mere convenience of a patentee he may enlarge the scope of the patent monopoly by requiring as a condition of his license that the licensee buy unpatented components from the licensor. Misuse of a patent has been consistently disapproved by this Court. The astounding fact is that the Court of Appeals so held without citation of a single authority, or discussion of the several opinions of this Court holding that a patentee resorting to this practice is precluded from enforcing his patent.

Opinions Below

The Opinion of the Court of Appeals is reported at 345 F.2d 351, 145 USPQ 304, and is reprinted in the Appendix, page A-3, *infra*. The Opinion of the District Court for the Northern District of Illinois, Eastern Division, is reported at 142 USPQ 1, and is reprinted in the accompanying Appendix previously filed by Petitioner with the Court of Appeals.

Jurisdiction

The judgment of the Court of Appeals was entered on April 28, 1965 (Appendix, page A-3, *infra*). A timely Petition for Rehearing was denied June 1, 1965 (Appendix, page A-10, *infra*). The jurisdiction of this Court is invoked pursuant to 28 U.S.C. 1254(1). Jurisdiction in the District Court was based upon 28 U.S.C. 1338(a) and Title 35 of the United States Code.

QUESTIONS PRESENTED

I. Should this Court permit a patentee to ask tribute upon the basis of a claim which, as a matter of law, is clearly void because of anticipation under 35 U.S.C. 102, because of obviousness under 35 U.S.C. 103, and also because of functionalism under 35 U.S.C. 112? (If the opinion below is allowed to stand, it will have the effect of giving Plaintiff-Respondent a monopoly on an internal combustion engine cooling system which is shown in and taught by expired patents not cited by the Patent Office).

II. Should this Court let stand a judgment sanctioning the unlawful practice of extending a patent monopoly by requiring the purchase from Plaintiff-Respondent of unpatented articles?

III. Should this Court exercise its supervisory responsibility to ensure compliance with the authoritative pronouncements of this Court? The rulings for which review is sought are contrary on each of the foregoing issues to the applicable law as announced in decisions of this Court which have been disregarded below without discussion or citation of authority.

STATEMENT OF FACTS

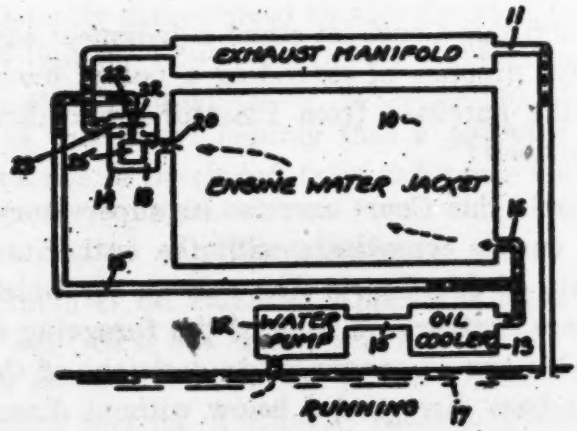
Plaintiff-Respondent is an individual engaged in the marketing of thermostatic controls. Petitioner-Defendant below is a manufacturer of outboard motors in which the accused structure is used.

The Patent In Suit

In 1951, Patent 2,536,642 (Appendix, page A-14, *infra*) issued to Respondent and disclosed a so-called bypass type of cooling system for a marine internal combustion engine. Only Claim 3 is in suit. A bypass type of cooling system is an easily comprehended mechanical arrangement

and is characterized by the use of a thermostatic valve which regulates the temperature of the coolant in an engine cooling jacket by controlled apportionment of continuous coolant flow from a supply pump so that such portion of the flow as is not required for cooling is diverted through a bypass line.

The cooling system of the patent in suit is diagrammatically shown below in Figure 3 of the patent in suit.



In operation, water pumped from source 17 by pump 12 has two available paths controlled by a thermostatic apportioning valve 14. One path is from the pump 12 through line portion 16, to engine water jacket 10, and through a short pipe length 20 to the valve 14. The other path is through a bypass line 15 (located immediately above the water pump 12 and below water jacket 10) to valve 14. In valve 14, a thermostatically operated disk 32 operates between ports respectively communicating with the engine jacket discharge pipe 20 and the bypass line 15 to thereby control water return to the source 17 via exhaust line 11 by apportioning flow from the engine jacket 10 and the

bypass line 15 in accordance with the temperature of the coolant discharged through pipe 20 from the engine jacket 10.

Significantly, the patentee-respondent considered his invention to reside in the employment of a thermostatic valve to apportion flow between the engine cooling jacket and the bypass line.[1] Only Claim 3 is in suit. It is broadly and functionally directed to the accomplishment of this result.[2]

A substantial number of Petitioner's allegedly infringing units are involved in this litigation. Other manufacturers of outboard motors may ultimately be involved.

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[1] Accompanying Appendix previously filed by Petitioner with the Court of Appeals, pages 30 and 31.

[2] Claim 3 is diagrammed as follows:

In cooling system for a marine internal combustion engine having

a water jacket,

a water line communicating with a source of water supply at one end and with said water jacket at the other end,

a water pump in said line,

a water discharge pipe in said jacket,

a valve housing provided with a thermostatically controlled valve member connected to the end of said discharge pipe,

an exhaust pipe communicating at one end with said valve housing and extending at its other end to a point of discharge,

and a second water line communicating at one end with said first mentioned water line and at its other end with said valve housing member,

said valve capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times.

Factual Basis for Question I: Invalidity

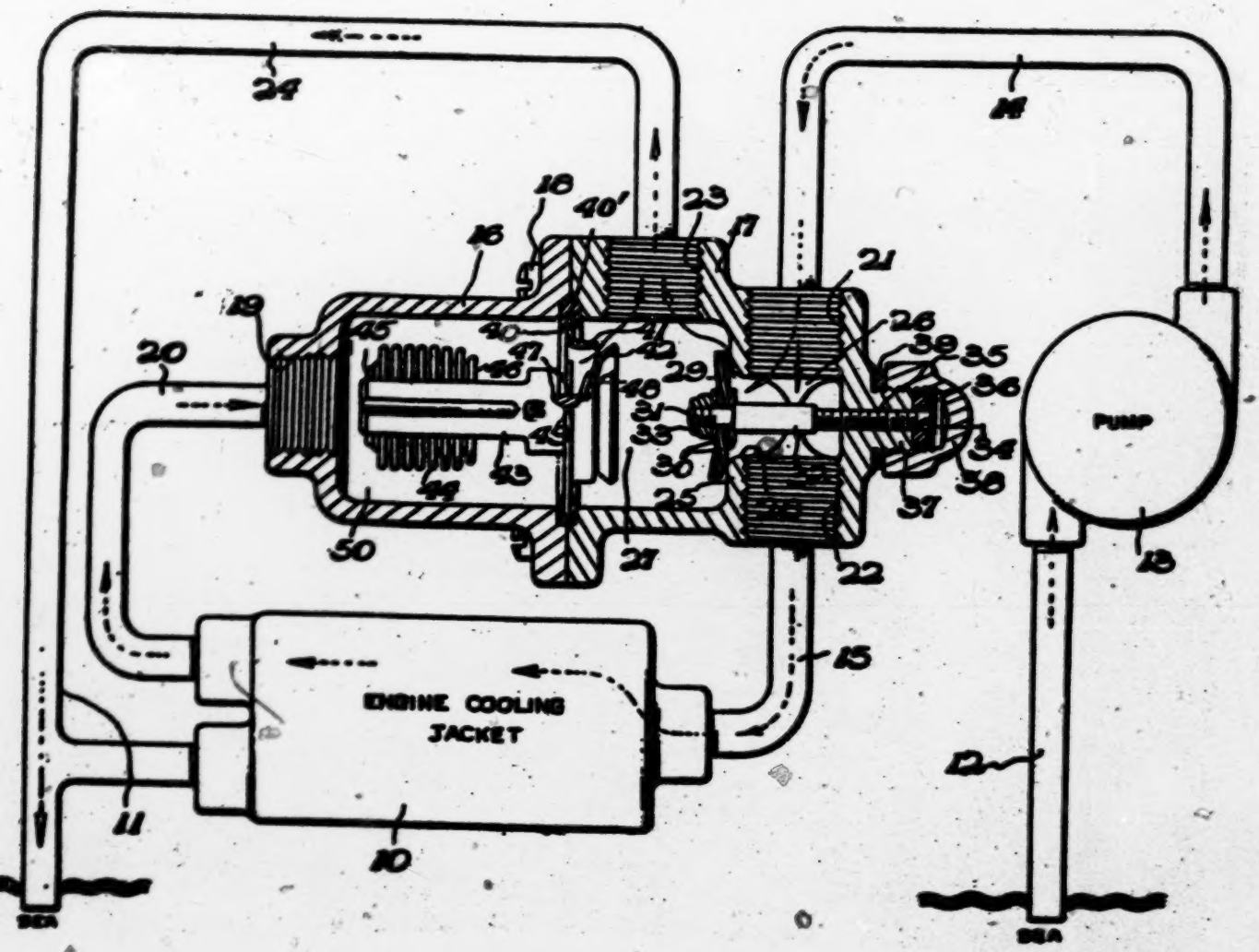
Petitioner is asserting that the language of the single claim in suit fails to define invention over expired prior art patents which were *not cited* by the Patent Office.

Morgan Patent 2,471,533 (Appendix, page A-18, *infra*) discloses a cooling system for a marine internal combustion engine, said system including the following elements (reference numbers in parentheses refer to the drawing of the Morgan patent printed hereinafter on page 7):

an engine water jacket (10),
a supply water line (12, 14, 15),
a water pump (13),
an engine jacket water discharge pipe (20),
a valve housing (16, 17) provided with a thermostatically controlled valve member (48),
an exhaust pipe (24), and
a second or bypass water line (port 28).

The Morgan thermostatic valve member 48 functions exactly as set forth in the below quoted language of the claim in suit, *i.e.*, the valve member 48 is

> "capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times."


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SEA

This function is clearly disclosed by Morgan.[3] A chart showing the application of the claim in suit to the Morgan device can be found at Page A-11 of the Appendix, *infra*.

---

[3] Morgan, Patent 2,471,533, Column 4, line 47 to Column 5, line 13, is as follows:

> ". . . any further rise in the temperature of the water flowing through the chamber 50 will cause the thermostat 44 to expand, opening the valve 48 so as to permit the water flowing through the engine jacket and chamber 50 to flow through the port 42 into the chamber 27, and thence through the conduit 24 to the exhaust pipe. When thereafter the temperature of the water flowing through the chamber 50 starts to decrease the thermostat 44 will correspondingly contract and move the valve member 48 toward its seat, proportionately decreasing the flow of water through the engine jacket.
>
> "Thereby the temperature of the water flowing through the engine jacket can be nicely controlled within predetermined limits selected as desirable for the particular engine under regulation. At the same time the volume of water flowing through the port 42 predetermines the back pressure existing in the passage 26 so that the amount of water flowing through port 28 past the pressure operated valve 29 is generally in inverse proportion to the quantity of water flowing through the engine jacket. Thereby irrespective of the load on the engine and the temperature of the water being pumped, the temperature of the water in the engine jacket may be nicely controlled so as to be kept within predetermined limits, while at all times an adequate volume of water is flowing through the conduit 24 to prevent overheating of the exhaust pipe. The pump may accordingly be given adequate capacity to afford proper cooling of the engine under the most adverse conditions, and even though the pump is thereby delivering a quantity of water in excess of the requirements of the engine cooling system, the portion of the water flowing through the engine jacket is so predetermined as to maintain the desired range of temperature while all excess water flows through the pressure operated valve 29 to the outlet conduit 24 where it is effective in cooling the exhaust pipe."

The Morgan patent is not the only prior art patent which discloses all of the elements of the claim in suit. The Giesler Patent 1,561,153 (Appendix, page A-23, *infra*) discloses an internal combustion engine cooling system which includes all of the elements of the claim in suit. Specifically, the Giesler patent discloses (reference numerals refer to Figure 1 of the Giesler patent printed hereinafter):

an engine water jacket (1),

a supply water line (6, 2),

a water pump (5),

an engine jacket water discharge pipe (3),

a valve housing (8) provided with a thermostatically controlled valve member (13, 14),

an exhaust pipe (7), and

a second or bypass water line (9).

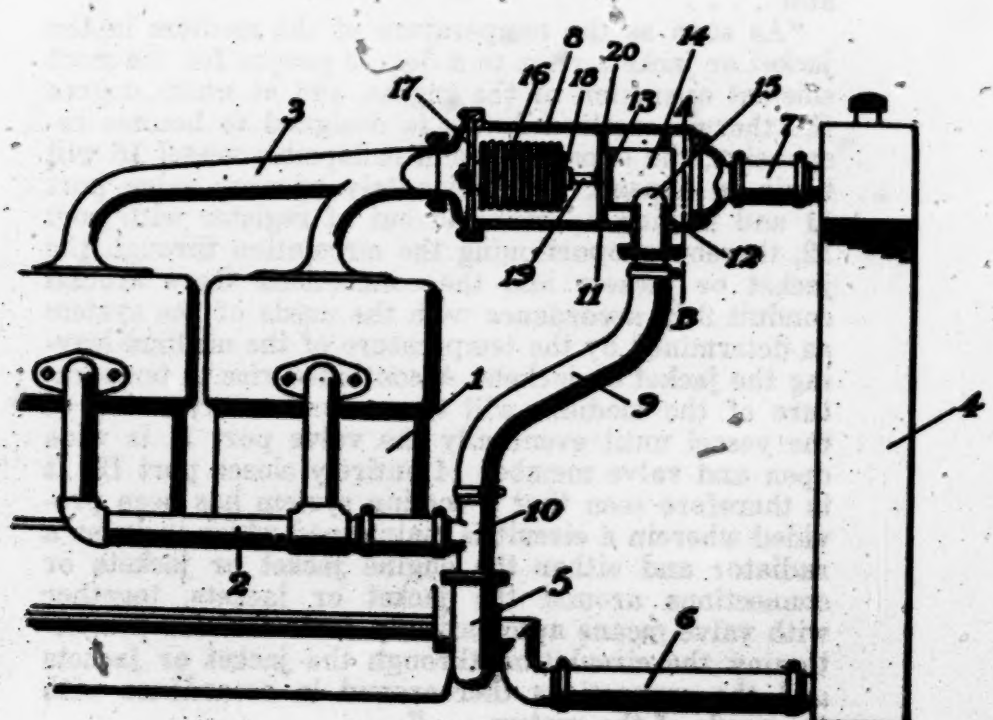


Fig. 1.

The Giesler patent functions exactly as set forth in the below quoted language of the claim in suit, i.e., the valve is

> "capable of controlling the flow of water through said discharge pipe at times and capable of controlling the flow of water through said exhaust pipe and second mentioned water line at times."

This is fully explained in the Giesler patent.[4] A chart

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[4] Giesler Patent 1,561,153, Page 2, lines 36-48 and lines 68-96 is as follows:

> "When the engine is started, the cooling medium of the system will normally be at the same temperature as the outside air. The expansible and collapsible vessel 16 will accordingly be contracted, maintaining valve port 11 closed and aperture 15 in register with port 12, whereby conduit 9 is in complete communication with the radiator 4. Pump 5 will then withdraw the cooling medium from the radiator 4 through conduit 6, and deliver the same through T-coupling 10, conduit 9, opening 15 and conduit 7 back to the radiator . . . .
>
> "As soon as the temperature of the medium in the jacket or jackets rises to a degree proper for the most efficient operation of the engine, and at which degree the thermosensitive device is designed to become responsive, the expansible and collapsible vessel 16 will begin to expand, proportionately opening valve port 11 and moving aperture 15 out of register with port 12, thereby proportioning the circulation through the jacket or jackets and the connections there around conduit 9 in accordance with the needs of the system as determined by the temperature of the medium leaving the jacket or jackets. A continued rise in temperature of the medium will cause further expansion of the vessel until eventually the valve port 11 is wide open and valve member 14 entirely closes port 12. It is therefore seen that a cooling system has been provided wherein a circuit is maintained which includes a radiator and either the engine jacket or jackets or connections around the jacket or jackets, together with valve means automatically controlled for proportioning the circulation through the jacket or jackets and the connections therearound in accordance with the needs of the system. . . ."

showing the application of the claim in suit to the Giesler device can be found on page A-12 of the Appendix, *infra*.

In addition to the Morgan and Giesler patents, the expired prior art Rayfield Patent 1,528,788 (Appendix, page A-27, *infra*) also discloses an internal combustion engine cooling system which includes all of the elements of the claim in suit. As shown in Figures 1 and 2 thereof, the Rayfield patent discloses (reference numerals refer to Figures 1 and 2 of the Rayfield patent printed hereinafter):

an engine water jacket (35),

a supply water pipe (37, 39),

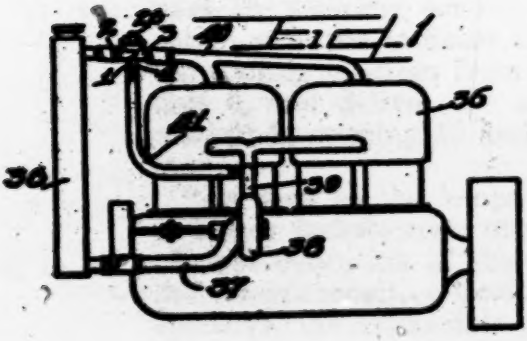
a water pump (38),

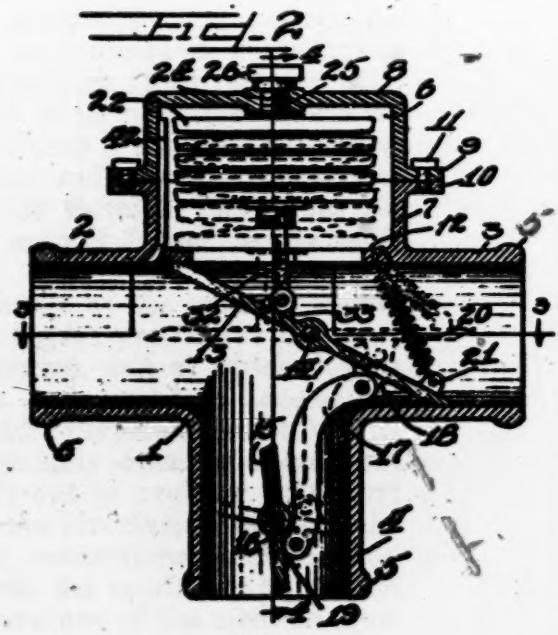
an engine jacket water discharge pipe (40),

a valve housing which is provided with a thermostatically controlled valve member (13, 15),

an exhaust pipe (unnumbered), and

a second or bypass water line (41).





The function of the Rayfield device is also identical to the function set forth in the below quoted language of the claim in suit, *i.e.*, the valve is

> "capable of controlling the flow of water through said discharge pipe at times and capable of controlling the flow of water through said exhaust pipe and second mentioned water line at times."

This function is fully explained in the Rayfield patent.[5]

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[5] Rayfield Patent 1,528,788, Page 4, lines 89-104 and line 112 to Page 5, line 7, is as follows:

> "When the engine is started and the temperature of the cooling fluid is lower than the temperature that is desired to be maintained in the cylinder jacket, the valves 13 and 15 will occupy the position shown in Figure 2, and prevent discharge of water from the water jacket of the engine and at the same time will permit the pump 38, to circulate the water through the pipe 41, and the open valve 15, and back through radiator, which circulation through the radiator is of benefit, as it permits normal operation of the pump, maintains the water inactive in the cylinder jacket and permits more rapid heating thereof, and also in cold weather prevents freezing of the radiator. . . . When the temperature in the chamber 7, reaches the degree at which the thermostat 22, is designed to operate, the hollow disks thereof, will expand and open the valve 13, and close the valve 15, so as to retard circulation in the pipe 3, and permit circulation through the cylinder jacket, and when the entire volume of water has become heated to some extent, and the engine is running, so as to heat the water in the cylinder jacket sufficiently to maintain the water in the thermostatic chamber 7 at the desired temperature, the valve 13, will remain open, and the valve 15, closed, so that the entire circulation takes place in the cylinder jacket. If, however, the amount of heat given off by the engine is diminished and the temperature of the water reduced, the thermostat will automatically close the valve 13, sufficiently and open the valve 15, a corresponding amount so as to limit the circulation in the cylinder jacket and prevent cooling below the desired temperature, and by this means, the water in the cylinder jacket is constantly maintained at the temperature desired."

A chart showing the application of the claim in suit to the Rayfield device can be found on page A-13 of the Appendix, *infra*.

The language employed in the single claim in suit provides the factual basis for Defendant's assertion of invalidity because of functionalism. (See footnote 2, *supra*, page 5.)

Factual Basis for Question II: Unenforcibility (Patent Misuse)

Petitioner is also asserting that the Respondent's conduct constitutes an illegal extension of the patent monopoly and renders the patent in suit unenforceable. In this regard, in June of 1952, Respondent entered into an agreement with Chris-Craft Corporation, which agreement was admitted by the Respondent to be in effect at the time of the trial. The agreement (Appendix, page A-34, *infra*) expressly provided, in part, for licensing the

> "... use of the Holley temperature control system and Patent No. 2536642. It is understood that you will *exclusively* use in such housings thermostats *furnished* by me." (Emphasis supplied.)

Factual Basis for Question III: Lack of Compliance With the Authoritative Decisions of This Court

The facts already stated support this proposition in the light of the authorities cited hereinafter. In addition, despite abundant citation by Defendant-Petitioner of the applicable law, the opinion below fails to cite *any* case of *any* court. Moreover, the opinion below does not evidence any comparison of claim language with the prior art to determine whether the claim defines over the prior art, patentably or otherwise.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

This case involves Clause 8 of Section 8, Article I of the Constitution of the United States and Sections 102, 103 and 112 of Title 35, United States Code. These provisions are set forth in the Appendix, beginning at page A-1, *infra*.

REASONS FOR GRANTING THE WRIT

I

To protect the right of the public to the benefit of free competition and to remedy an injustice to the Petitioner; and

II

To ensure compliance by the lower courts with precedents set by this Court, particularly with respect to:

A) Patent Invalidity because of

1. Anticipation (35 U.S.C. 102),
2. Obviousness (35 U.S.C. 103), and
3. Claim Functionalism (35 U.S.C. 112), and

B) Patent Misuse.

• • • • •

I

This Court has uniformly and consistently protected the right of the public to the benefits of free competition. The judgment below has the result of diminishing free competition

1. by upholding the validity of a patent in violation of the pronouncements of this Court as to the proper legal criteria for determining claim validity, and
2. by sanctioning an abuse of the patent monopoly by use thereof to require purchase of unpatented articles from the patentee.

With respect both to the public and to private litigants, the judgment below denies the protection which this Court has demanded by its authoritative pronouncements.

A patent claim is beneficially in line with constitutional objectives only when it defines the inventor's actual contribution to the art. A patent claim is an instrument of oppression and extortion when it covers what is old in derogation of the right of industry to use what is in the public domain. In the instant suit, Petitioner has been held liable in damages for using old structures which it lawfully is entitled to employ without question, and as to which Petitioner's right of use could not be challenged but for the nebulous language of the claim in suit, which the Court below has interpreted to cover what was in fact old.

The opinion below not only refrains from discussing the authorities called to its attention but fails entirely to support its decision by reference to *any* decision of this Court or any other court. If the opinion below is allowed to stand, it will have the effect of giving Plaintiff-Respondent a monopoly on an internal combustion engine cooling system which is shown in and taught by expired patents. It has the effect, moreover, of giving judicial approval to the practice, often condemned by this Court, of explicitly conditioning licenses on the purchase of unpatented components from licensor (Plaintiff-Respondent).

II

The Court below has failed to comply with the authoritative pronouncements of this Court with respect to the issues of patent invalidity and patent misuse.

PATENT INVALIDITY

In patent cases, this Court has consistently and uniformly held that the claim defines the invention and is the measure of the patent grant.[6] Moreover, this Court has held that patent claims should be strictly construed.[7] Thus, this Court has held that claim terminology should be viewed in the light of the prior art to ensure that such claim terminology defines patentable subject matter over expired prior art.[8]

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[6] See, for example:

Aro Manufacturing Co., Inc., et al. v. *Convertible Top Replacement Co., Inc.*, 365 U. S. 336, 339 (1961)

Great Atlantic & Pacific Tea Co. v. *Supermarket Equipment Corp. et al.*, 340 U. S. 147, 149 (1950)

[7] See, for example:

Halliburton Oil Well Cementing Co. v. *Walker et al.*, 329 U. S. 1, 10 (1946)

Sears Roebuck & Co. v. *Stiffel Company*, 376 U. S. 225, 230 (1964)

[8] "... it may very well be, if he had set up in his claim the improvements or particular changes in the construction of the old machine, so as to enable him to adapt it to the new use, and one to which the old had not and could not have been applied without these changes, the patent might have been sustained. ...

"But no such claim is set up by the patentee. ...

"The defect here is both in the specification and in the claim ... the latter, instead of claiming the old parts, should have excluded them, and claimed the new, by which the old were adapted to the new use, producing the new result."

William H. Phillips v. *George Page*, 65 U. S. (24 How.) 164, 166-168 (1860)

In the instant case, the claim terminology does not define anything novel, much less patentable, over the prior art. Despite Petitioner's urging, the *Court below did not comment on claim language or discuss the subject matter in terms of the claims.*

The evidence relied upon by Petitioner is documentary, *i.e.*, the expired prior art patents to Morgan 2,471,533; to Giesler 1,561,153; and to Rayfield 1,528,788. Even the most casual analysis of these patents will show that the conclusions reached by the Court below were clearly erroneous as a matter of law. There is no testimony which can alter the facts shown by these documents. This Court has both the opportunity and the responsibility to ensure the application, by lower courts, of the correct criteria of invention. *Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp. et al.*, 340 U. S. 147 (1950).

Not one of the expired prior art patents to Morgan, Giesler and Rayfield was cited by the United States Patent Office against the patent in suit.

Anticipation

With respect to the statutory criteria of novelty, *i.e.*, anticipation, a claim is invalid, as a matter of law, if the subject matter therein defined is disclosed by a prior patent.[9] (35 U.S.C. 102)

Every word of the claim in suit finds full response in the Morgan Patent 2,471,533. The opinion below does not

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[9] "The test is whether the invention was 'known or used by others in this country, before his invention or discovery thereof.' The elements which preclude patentability are a patent, or a description in a printed publication in this or any foreign country, which antedates the invention or discovery of the applicant."

Electric Storage Battery Co. v. *Shimadzu et al.*, 307 U. S. 5, 11 (1939).

discuss the claim language. While it discusses Morgan (and erroneously describes its operation), the opinion does not compare the claim language with the disclosure of the Morgan patent. In this respect, the lower court has failed to follow the decisions of this Court that the claims define the alleged invention in terms differentiating the alleged invention with particularity from the prior art.

Despite briefs in the Trial Court and the Court of Appeals which stressed the clear, unequivocal language of the Morgan patent,[10] the opinion of the Court of Appeals erroneously describes the operation of the apportioning valve in the cooling system disclosed in the Morgan patent. Had the Court correctly understood the clear language of the Morgan patent describing the functioning of the Morgan apportioning valve, any attempt to apply the claim language would have disclosed complete anticipation by Morgan.

The erroneous description of the Morgan device, as quoted immediately below, was taken by the Court of Appeals substantially verbatim from the Opinion of the Trial Court and is found substantially verbatim in the Trial Court's Finding of Fact 22 and in Plaintiff's proposed Finding of Fact 50.

> "However, in the Morgan patent, two cooperating valves are used. The first valve which is thermostatically operated, controls or blocks the flow of water through the engine water jacket. The second valve is pressure-operated and releases water from the system only when the other valve is in a closed position." (Appendix, page A-7, *infra*)

It is contrary to fact to state that in Morgan the second valve

> "releases water from the system only when the other valve is in a closed position."

---

[10] See footnote 3, *supra*, page 8.

The fact is that the Morgan disclosure *expressly* states that the thermostatic valve serves to *apportion* flow between the bypass port and the water jacket *precisely* as called for in the claim in suit. The Morgan patent specifically so states in Column 4, lines 47-59, and in Column 5, line 13.[11] There is no contrary testimony relating to the operation of the Morgan valve. Accordingly, this above quoted portion of the lower court's opinion is clearly erroneous as a matter of law.

What both Courts below appear to have overlooked is the fact that the two valves of Morgan function as one. The so-called second valve is completely subservient to the first and *progressively* opens as the first valve, *i.e.*, thermostatic valve, closes, and vice versa. The apportionment is both *progressive and continuous.* Thus, the Morgan thermostatic valve does what the words of the claim in suit call for—namely, controls the flow of water through the engine jacket discharge pipe and the bypass pipe.

In spite of the decisions of this Court to the effect that *the claims define the invention and should be strictly construed,* it appears that the Court of Appeals attempted to read into the claims in suit various limitations *which are nowhere found therein.* For example, the claim in suit is *not* restricted to the use of a single valve nor is there any claim language excluding the presence of back pressure in the system. So far as the claim language is concerned, the Morgan valve is as "capable" as the Holley valve of apportioning flow between the engine discharge pipe and the bypass.

At the trial, *the patentee represented that his alleged invention resided in the apportionment of coolant flow between the engine jacket discharge pipe and the bypass pipe in accordance with the cooling requirements of the*

---

[11] See footnote 3, *supra,* page 8.

engine.[12] The alleged invention, as the Plaintiff-Patentee himself describes it, is wholly found precisely in accordance with the claim language in the Morgan patent. The *claim* in suit *deliberately* employed broad terminology setting forth this *function* and is devoid of *any distinction* over the Morgan disclosure. Accordingly, your Petitioner respectfully submits that the claim in suit is, as a matter of law, invalid by reason of anticipation under 35 U.S.C. 102. It is therefore respectfully requested that Certiorari be granted and that the Court below be overruled in order to protect the public interest as well as to remedy an injustice to your Petitioner.

Obviousness

This Court already has granted certiorari in several cases[13] involving "obviousness" in the context of 35 U.S.C. 103, and relating to interpretation of the proper standard of invention. Petitioner submits that the present case presents subject matter which is more clearly obvious than *any* of the cases in which certiorari has been granted by this Court. Even before the adoption of 35 U.S.C. 103, this Court had repeatedly held, in effect, that

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[12] Accompanying Appendix previously filed by Petitioner with the Court of Appeals, pages 30 and 31.

[13] *Graham* v. *John Deere Company* (No. 580, October, 1964 term) 85 S. Ct. 652 (1965)
Calmar, Inc. v. *Cooke Chemical Co.* (No. 788, October, 1964 term) and
Colgate-Palmolive Co. v. *Cooke Chemical Company* (No. 810, October, 1964 term) 85 S. Ct. 1082 (1965)
United States v. *Adams* (No. 906, October, 1964 term) 85 S. Ct. 1090 (1965)
Hazeltine Research, Inc. v. *Ladd* (No. 919, October, 1964 term) 85 S. Ct. 1108 (1965)

obvious improvements do not justify the grant of a patent.[14]

The Jungersen case (cited in footnote 14), is directly applicable. Each of the Giesler Patent 1,561,153 and the Rayfield Patent 1,528,788, discloses an automotive internal combustion engine cooling system including a coolant bypass line and a *single* valve structure which apportions coolant flow between a bypass pipe and the engine jacket and which excludes back pressure from the system.[15] Except for the term "marine" in the *introduction* of the claim in suit, *every* word in the claim in suit finds full response in each of the Giesler and Rayfield patents. The Courts below did not find or conclude otherwise.

The patent statute as set forth in 35 U.S.C. 103 and the standard of invention enunciated by this Court, as for instance, in *Great Atlantic and Pacific Tea Company* v. *Supermarket Equipment Corporation et al.*, 340 U. S. 147 (1950) preclude, as a matter of law, any finding or conclusion to the effect that something more than mere mechanical skill would be involved in the substitution of either of the Giesler or Rayfield valves in an identical

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[14] "Thus Jungersen employed in his claimed invention well known skills and practices in a manner and for a purpose long familiar in the field of casting. His claimed improvement is therefore not patentable.

". . . we think that the improvements in the art of casting which were disclosed by the patents and publications discussed above were so obviously applicable to the type of casting sought to be effected by Jungersen that he was bound by knowledge of them."

Jungersen v. *Ostby & Barton Co. et al.*, 335 U.S. 560, 566-567 (1949)

See also:

Great Atlantic & Pacific Tea Co. v. *Supermarket Equipment Corp. et al.*, 340 U.S. 147 (1950)

[15] See footnotes 4 and 5, *supra*, Pages 10 and 13, respectively.

engine cooling arrangement employed in any marine internal combustion engine. The Morgan patent discloses such an engine and a comparable apportioning system for the cooling water. As a matter of law, such a substitution is clearly obvious and renders the patent in suit invalid.[16] Accordingly, your Petitioner submits that the claim in suit is, as a matter of law, invalid in view of 35 U.S.C. 103 and respectfully requests that this Court grant certiorari and overrule the Court below in order to protect the public interest as well as to protect your Petitioner.

Claim Functionalism

This Court has held that functionalism, one aspect of failure of compliance with 35 U.S.C. 112, renders a patent claim invalid. In the General Electric case, this Court held that conveniently functional language at the exact point of novelty renders a claim invalid.[17] The General Electric case is directly applicable here. The claim in suit merely recites in functional terms that the valve is

---

[16] In the opinion below, no reference is made to obviousness or to the standard of invention, except as follows:

> "We hold the District Court was correct in concluding that the Morgan, Giesler and Rayfield patents, singly or in combination, did not anticipate plaintiff's patent and render it obvious. Plaintiff's system was not obvious to others skilled in the trade." (Appendix page A-8, *infra*)

[17] "But the vice of a functional claim exists not only when a claim is 'wholly' functional, if that is ever true, but also when the inventor is painstaking when he recites what has already been seen, and then uses *conveniently functional language at the exact point of novelty.*" (emphasis supplied)

General Electric Co. v. *Wabash Appliance Corporation, et al.*, 304 U. S. 364, 371 (1938)

See also:

Halliburton Oil Well Cementing Co. v. *Walker et at.*, 329 U. S. 1, 8-9 (1946)

"*capable* of controlling the flow of water through said discharge pipe at times and also *capable* of controlling the flow of water through said exhaust pipe and said second mentioned water line at times." (emphasis supplied)

The claim in suit does not define structure supporting the functional statement. There is no recital of a valve seat location or any structure which relates the "valve member" to the "discharge pipe", the "exhaust pipe", or the "second water line" (*i.e.*, the bypass pipe) so as to result in the function set forth in the claim portion quoted above. Such conveniently functional language renders the claim in suit invalid. Moreover, even the conveniently functional language is fully satisfied by each of the Morgan, Giesler, and Rayfield patents.[18]

The opinion of the Court of Appeals is silent with respect to the authoritative pronouncements of this Court which have been brought to its attention. Your Petitioner therefore respectfully submits that the claim in suit is, as a matter of law, invalid and respectfully requests that this Court grant certiorari and overrule the Court below in order to protect the public interest as well as to protect your Petitioner.

PATENT MISUSE

This Court has held that any presently subsisting conduct which extends a patent monopoly renders the patent unenforceable.[19] The evidence on which Petitioner re-

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[18] ". . . a characteristic essential to novelty may not be distinguished from the old art solely by its tendency to remedy the problems in the art met by the patent." *General Electric* v. *Wabash Appliance Corporation et at.*, 304 U. S. 364, 371-372 (1938)

[19] ". . . every use of a patent as a means of obtaining a limited monopoly of unpatented material is prohibited." *Leitch Manufacturing Company, Inc.* v. *The Barber Company, Inc.*, 302 U.S. 458, 463 (1938)

See also:

B. B. Chemical Co. v. *Ellis*, 314 U.S. 495 (1942)

lies in support of its position on patent misuse is primarily documentary. Specifically, *Plaintiff-Respondent* introduced at the trial an agreement (Appendix, page A-34, *infra*) between Plaintiff and Chris-Craft Corporation including the following paragraph:

> "I agree to furnish the Chris-Craft Corporation with Holley temperature control system thermostats for the sum of $2.85 each, it being understood that of this sum $1.00 is paid as a royalty for permitting you to build manifold and plate thermostat housings as standard equipment on your engines and the use of the Holley temperature control system and patent No. 2536642. *It is understood that you will exclusively use in such housing thermostats furnished by me.*" (emphasis supplied)

The unequivocal import of the last sentence is that purchase of the patentee's thermostats is a requirement for the granting of the license. Note the words "*exclusively use . . . thermostats furnished by me.*" Admittedly the thermostat is an unpatented item. Such a requirement is unlawful. Plaintiff testified at the trial that the agreement was still in effect.[20]

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[20] That the Plaintiff was well aware of the effect of his admissions was shown by his attempt to excuse his unlawful conduct by his testimony as follows:

> "Q. As I understand your arrangement with Chris-Craft, the arrangement is, as I interpret these documents, that in order to get a license under your patent they have to buy the thermostat from you, is that correct?
>
> A. They don't have to buy from me, no.
>
> Q. Isn't that what the letter says?
>
> A. Well, we state that they pay the royalty on the thermostat to save a lot of book work; to just add the royalty to their order for their billing." (Accompanying Appendix previously filed by Petitioner with the Court of Appeals, page 110)

In its opinion, the Court of Appeals said:

> "The trial court found that for the purposes of business convenience, the royalty is included in the purchase price." (Appendix, page A-9, *infra*)

This Court has held that *business convenience is not an excuse.*

> "The patent monopoly is not enlarged by reason of the fact that it would be more *convenient* to the patentee to have it so, or because he cannot avail himself of its benefits within the limits of the grant." (Emphasis supplied)
>
> *B. B. Chemical Co.* v. *Ellis et al.*, 314 U.S. 495, 498 (1942)

The lower court having decided this case contrary to the applicable decisions of this Court, it is respectfully requested that this petition be granted and the opinion below be reversed.

CONCLUSION

In view of the foregoing specified instances wherein the lower court has decided federal questions in a way in conflict with the applicable decisions of this Court, it is respectfully requested that this Petition be granted and that the decision below be vacated.

Respectfully submitted,

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Robert E. Clemency
Wheeler, Wheeler & Wheeler
606 West Wisconsin Avenue
Milwaukee, Wisconsin 53203
Attorneys for Petitioner

APPENDIX

CONSTITUTIONAL AND STATUTORY PROVISIONS

Constitution of the United States of America
Article I, Section VIII.

> "The Congress shall have Power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries. . . ."

Title 35, United States Code
Section 102

> "A person shall be entitled to a patent unless—(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent. . . ."

Title 35, United States Code
Section 103

> "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

Title 35, United States Code
Section 112

> "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

"The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

"An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

IN THE

UNITED STATES COURT OF APPEALS

FOR THE SEVENTH CIRCUIT

DONALD A. HOLLEY,
Plaintiff-Appellee.

v.

OUTBOARD MARINE CORPORATION,
Defendant-Appellant.

Appeal from the United States District Court for the Northern District of Illinois, Eastern Division.

April 28, 1965

Before DUFFY and KILEY, *Circuit Judges*, and GRUBB, *District Judge*.

DUFFY, *Circuit Judge*. This is a suit for patent infringement. Plaintiff is the owner of United States Patent No. 2,536,642, issued January 2, 1951, for "Method of and Means for Controlling the Coolant of Marine Internal-Combustion Engines." Claim 3 of the patent is the only claim here in issue.

Plaintiff is engaged in the manufacture and sale of thermostatic controls and thermostats. Defendant is the manufacturer of various products including outboard motors and other marine engines.

The patent in suit relates to a marine engine cooling system which utilizes a water by-pass line. By stipulation, the alleged infringement of Claim 3, was in defendant's 5½, 10 and 18 horsepower outboard motors for the model years 1959, 1960, and several months of 1961.

Defendant denied infringement and alleged that Claim 3 was invalid, 1) for failure to claim an invention within the meaning of 35 U.S.C. § 112, 2) because anticipated by

the prior art, and 3) as unpatentable for lack of invention over the prior art, as exemplified by three prior patents.

Marine cooling systems are constructed with the danger in mind that fire might result from overheated exhaust manifolds and pipes. It was earlier thought necessary to maintain a constant flow of water through the exhaust pipe. Prior to the date of plaintiff's invention, the typical marine engine cooling system involved only the pumping of water from the source (a body of water in which the boat is floated), directly through the engine water jacket and thence through the exhaust pipe. As the trial court pointed out, because of the absence of any provision for the retention of water in the water jacket until a desirable engine operating temperature had been reached, the engine would, at first, run cold and fail to vaporize the fuel properly. By contrast, in automobile engines, the problem of inflammable gas accumulation is not present, and the exhaust manifold and pipe are air-cooled.

The problems facing plaintiff were the divergent requirements for: 1) a continual flow of water through the exhaust pipe for cooling purposes; 2) sufficient cooling water in the water jacket to avoid overheating of the engine, and 3) the capability of retaining water within the water jacket when it was sought to raise the engine temperature to a desirable operating level. These ends could not normally be obtained by the continual circulation of water through the water jacket.

Plaintiff's answer to the problems was to employ a feature of a recirculation system he had previously demonstrated, the retention of water within the cooling system until engine temperature was sufficiently high without a reduction in the flow of water overboard through the exhaust manifold and pipe. This was accomplished by the use of two lines into which the incoming flow of water could be directed. One line led through the water jacket, the other line by-passed it. As the trial judge pointed out

in his opinion, water passing through the by-pass line had no effect upon engine temperature.

The flow of water was apportioned between the lines by the operation of an expandable thermostat which was located at the point of their juncture on the outlet side of the cooling system. When the engine was cold and the bellows contracted, a valve disc blocked the passage of water through the water jacket. The flow of water into the engine remained substantially the same so that the incoming flow largely went into the by-pass line. But, as the engine warmed up, the thermostatic valve directed increasing amounts of water through the water jacket. The total volume of water going through the cooling system was not affected by the apportionment of the water between the two lines.

After filing his patent application in September 1949, defendant contacted the Chris-Craft Corporation which was then and is now, a large builder of boats. Plaintiff had been informed that Chris-Craft was opposed to the installation of any thermostatically controlled cooling system in marine engines, considering such systems to be unreliable. However, in 1950, plaintiff secured an order from Chris-Craft for 144 units which proved satisfactory. Subsequent orders were also received. In recent years, a majority of the larger six-cylinder Chris-Craft marine engines have been equipped with factory-installed temperature control systems of plaintiff's design.

In 1951, plaintiff contacted an Iowa agent of defendant company and installed his system on one of defendant's engines. Successful tests were made.

In November 1952, plaintiff contacted defendant's chief engineer in Waukegan, Illinois, and left with him drawings and a description of his invention. The engineer told plaintiff that the defendant was experimenting with a system but indicated a purchase from plaintiff would be considered if their own system proved to be unsuccessful.

On October 2, 1953, defendant's Director of Research, Watkins, submitted a sketch and suggested the development of a by-pass system. On April 10, 1956, Patent No. 2,741,231 was issued to Watkins. This patent was assigned to defendant. Shortly before trial, defendant disclaimed the Watkins patent.

On September 8, 1959, plaintiff gave defendant a notice of infringement. Although defendant denied infringement, it made certain changes in its temperature control system in late 1960 and early 1961.

In this case, the trial judge filed detailed findings of fact and conclusions of law which he prepared. He also filed an opinion which demonstrates that he had a clear understanding of the issues involved in this case. He found Claim 3 of the patent in suit to be valid and infringed. He also denied leave for defendant to file a second amended complaint and held that plaintiff has not misused the patent in suit.

In defendant's brief, it is asserted that "a number of findings are believed to be without support whatever in the evidence." Defendant has not specifically pointed out to which findings it has referred. However, we do not think any of the findings of fact are clearly erroneous but, on the contrary, are supported by substantial evidence.

We think the District Court was correct in holding that differences in the operation and purpose between automobile and marine cooling systems, are so substantial that patents cited by defendant pertaining to automotive systems[1] do not anticipate the patent in suit.

One of the objects of automotive cooling systems is to prevent the freezing of the cooling medium used therein. The automotive system is a closed system including a fan controlled radiator, an engine water jacket with a non-self priming paddle wheel type of pump for the circula-

---

[1] The Rayfield Patent No. 1,528,788, issued March 10, 1925, and the Giesler Patent No. 1,561,153, issued November 10, 1925.

tion of the water. The circulating pump of an automotive internal combustion engine cooling system is not satisfactory or practical for use in a marine internal combustion engine cooling system. The District Court so found and substantial evidence sustains that finding.

As of 1949, marine internal combustion engines generally did not employ thermostatically controlled cooling systems, in spite of the long-felt need for such a system.

The other patent principally relied upon by defendant is Morgan Patent No. 2,471,533. This patent does refer to a marine engine cooling system. However, in the Morgan patent, two cooperating valves are used. The first valve which is thermostatically operated, controls or blocks the flow of water through the engine water jacket. The second valve is pressure-operated and releases water from the system only when the other valve is in a closed position. We agree with the District Court that the operation of the thermostatic valve, in affecting water pressure within the cooling system, clearly distinguishes its function from the single valve in plaintiff's system.

The simplicity and efficiency of plaintiff's system clearly represented an advance or improvement over previous devised systems. It was recognized by the trade as having high merit. In spite of Chris-Craft's previous strong opposition to a thermostatically controlled system, they became converted and used plaintiff's system.

For reasons stated in the opinion of the District Court which need not be repeated here, the operation of the valve in plaintiff's system does not affect the total water flow. As with the accused system, the flow through the exhaust pipe remains substantially constant.

In view of findings of fact 5, 8, 9, 10 and 40, and the specifications and drawings of plaintiff's patent in suit, Claim 3 should be construed as being directed and limited to a cooling system for a marine internal combustion engine having a water jacket. Defendant cannot properly broaden the claim to encompass the entirely different

automotive internal combustion engine cooling system of the Giesler and Rayfield patents.

We hold the District Court was correct in concluding that the Morgan, Giesler and Rayfield patents, singly or in combination, did not anticipate plaintiff's patent and render it obvious. Plaintiff's system was not obvious to others skilled in the trade.

We hold the trial court properly found the invention of plaintiff's patent in suit was not anticipated by or described in any of the prior art. We think the trial court applied the correct legal criteria of 35 U.S.C. § 102, and properly concluded that Claim 3 of plaintiff's patent in suit is valid.

We likewise agree with the District Court's conclusion that Claim 3 of the patent in suit is not functional.

There remains only the issue presented by defendant that plaintiff has misused the patent in suit and hence Claim 3 is not enforceable. This defense has to do with the relationship between plaintiff and Chris-Craft Corporation.

In early 1952, Chris-Craft requested plaintiff to tailor his patented system to their marine engines in order to approve the appearance of the installations and to eliminate some of the external plumbing. Plaintiff did redesign the manifold of the Chris-Craft marine engines to incorporate his by-pass line, and he also designed special housings for use with the redesigned manifolds, and for the incorporation of his thermostatic control assemblies therein.

The District Court found that an understanding was reached between plaintiff and Chris-Craft Corporation in regard to sales to and use by Chris-Craft of thermostatically controlled assemblies, the temperature control unit and specially designed housings. The price fixed was a negotiated price. By the terms of the agreement, Chris-Craft Corporation is not required to purchase thermostatic control assemblies from plaintiff in order to obtain

a license under the patent in suit. When Chris-Craft Corporation purchases plaintiff's thermostatic control for the royalty of $1 (which is included in the purchase price), it obtains the right to build the specially designed housing and the right to use plaintiff's temperature control. The trial court found that for the purposes of business convenience, the royalty is included in the purchase price.

Plaintiff operates a small one-man concern with gross sales of about $7,000 annually. His bookkeeping is, apparently, as simple as possible. There is no evidence that there are available in commerce thermostatic control assemblies which can be incorporated in the redesigned housings manufactured by Chris-Craft.

We do not think there is anything about the relationship between plaintiff and Chris-Craft Corporation that spells out misuse of the patent in suit.

The judgment of validity of the patent in suit and of infringement of Claim 3 of that patent by defendant is

AFFIRMED.

A true Copy:

Teste:

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Clerk of the United States Court of Appeals for the Seventh Circuit.

UNITED STATES COURT OF APPEALS
For the Seventh Circuit
Chicago, Illinois, 60610

Tuesday, June 1, 1965

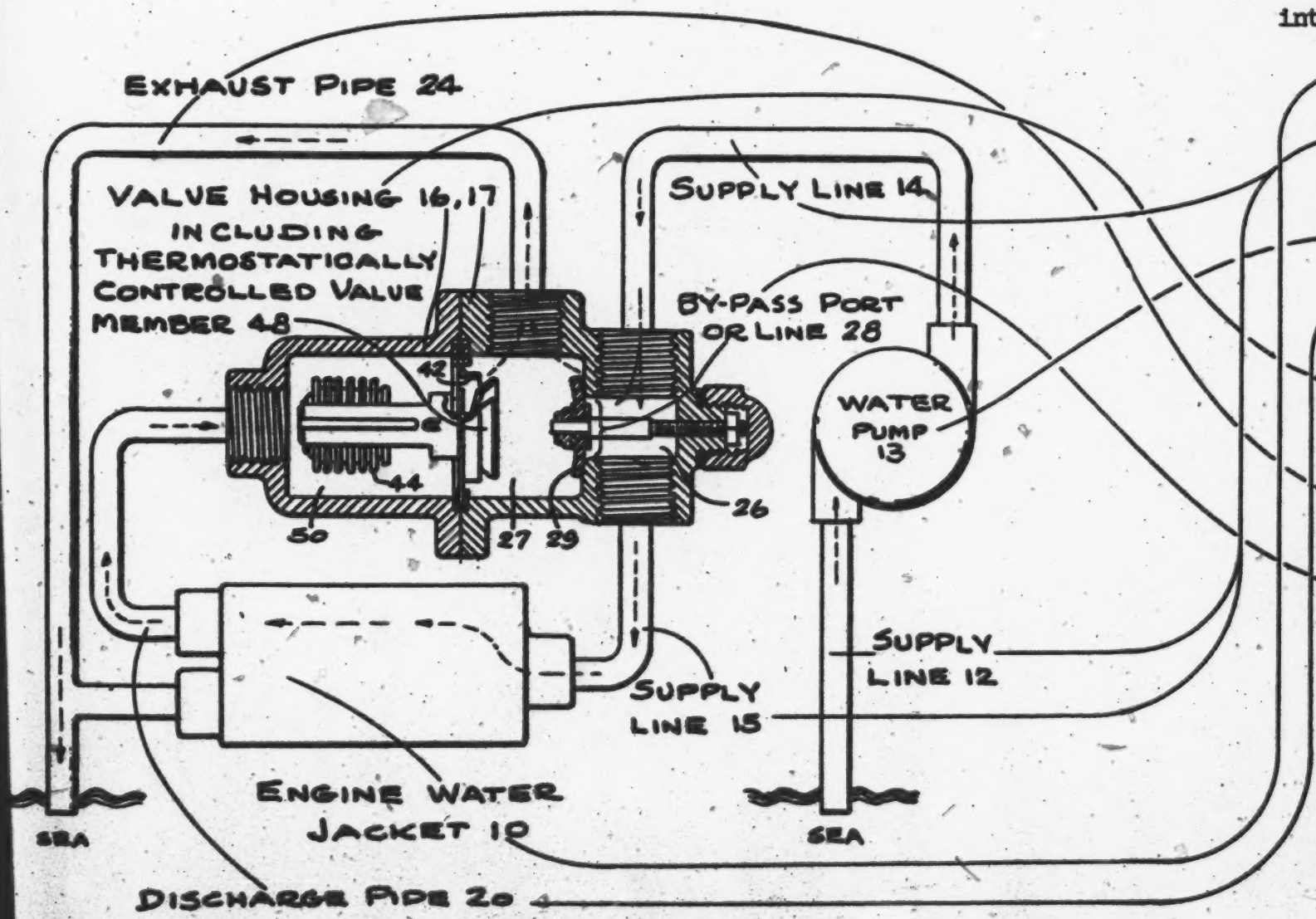
Before
Hon. F. Ryan Duffy, Circuit Judge
Hon. Roger J. Kiley, Circuit Judge
Hon. Kenneth P. Grubb, District Judge

DONALD A. HOLLEY,
Plaintiff-Appellee,
vs.
No. 14678
OUTBOARD MARINE CORPORATION,
Defendant-Appellant.

} Appeal from the United States District Court for the Northern District of Illinois, Eastern Division.

It Is Ordered by the Court that the petition for a rehearing of this cause be, and the same is hereby, Denied.

RESPONSE OF THE DISCLOSURE OF MORGAN PATENT 2,471,533 TO CLAIM 3 OF HOLLEY PATENT 2,536,642



MORGAN COOLING SYSTEM

CLAIM 3 of HOLLEY PATENT 2,536,642

In a cooling system for a marine internal combustion engine having

a water jacket,

a water line communicating with a source of water supply at one end and with said water jacket at the other end,

a water pump in said line,

a water discharge pipe in said jacket,

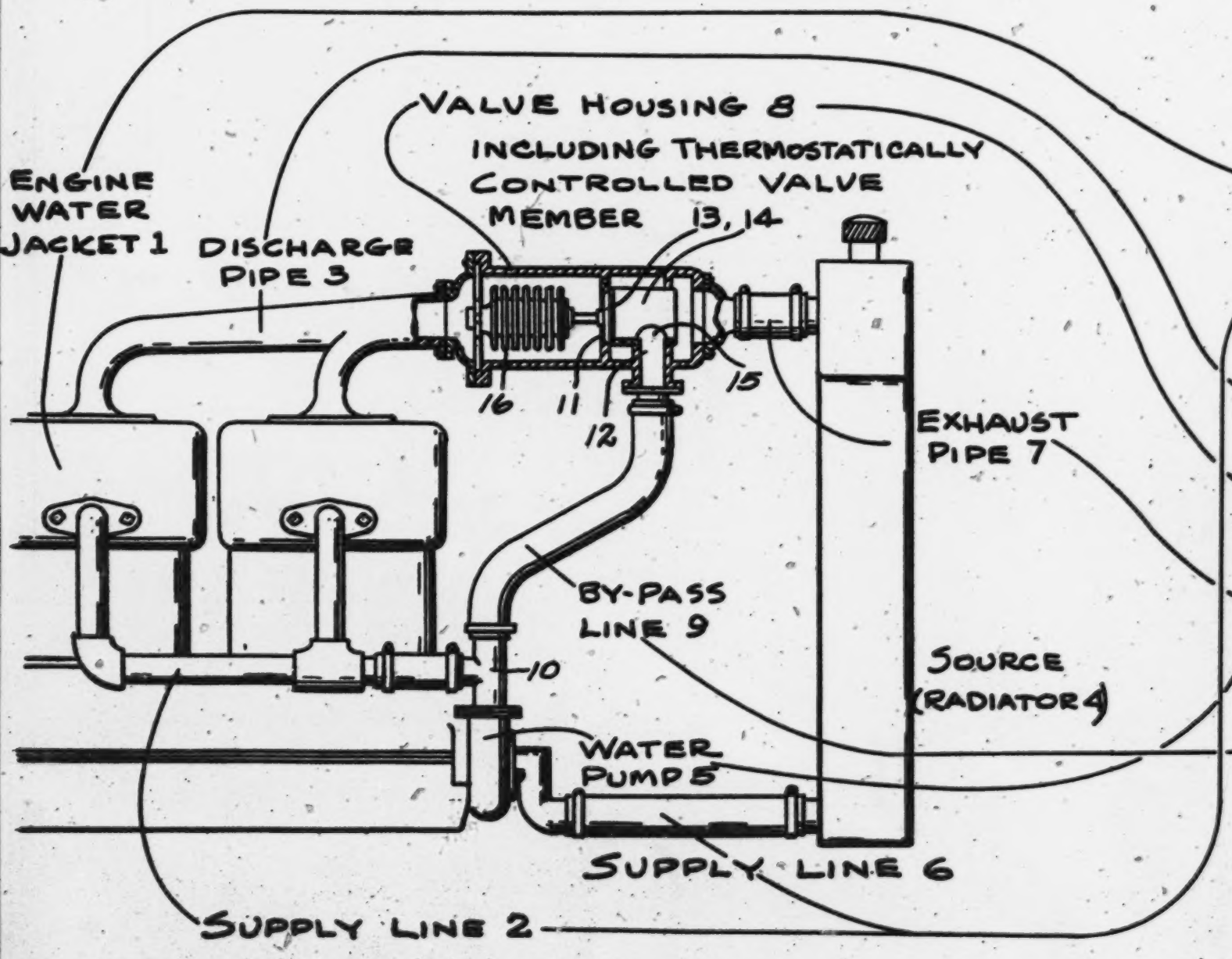
a valve housing provided with a thermostatically controlled valve member connected to the end of said discharge pipe,

an exhaust pipe communicating at one end with said valve housing and extending at its other end to a point of discharge,

a second water line communicating at one end with said first mentioned water line and at its other end with said valve housing member,

said valve capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times.

RESPONSE OF THE DISCLOSURE OF GIESLER PATENT 1,561,153 TO CLAIM 3 OF HOLLEY PATENT 2,536,642



GIESLER FIG. 1

CLAIM 3 of HOLLEY PATENT 2,536,642

In a cooling system for a marine internal combustion engine having

a water jacket,

a water line communicating with a source of water supply at one end and with said water jacket at the other end,

a water pump in said line,

a water discharge pipe in said jacket,

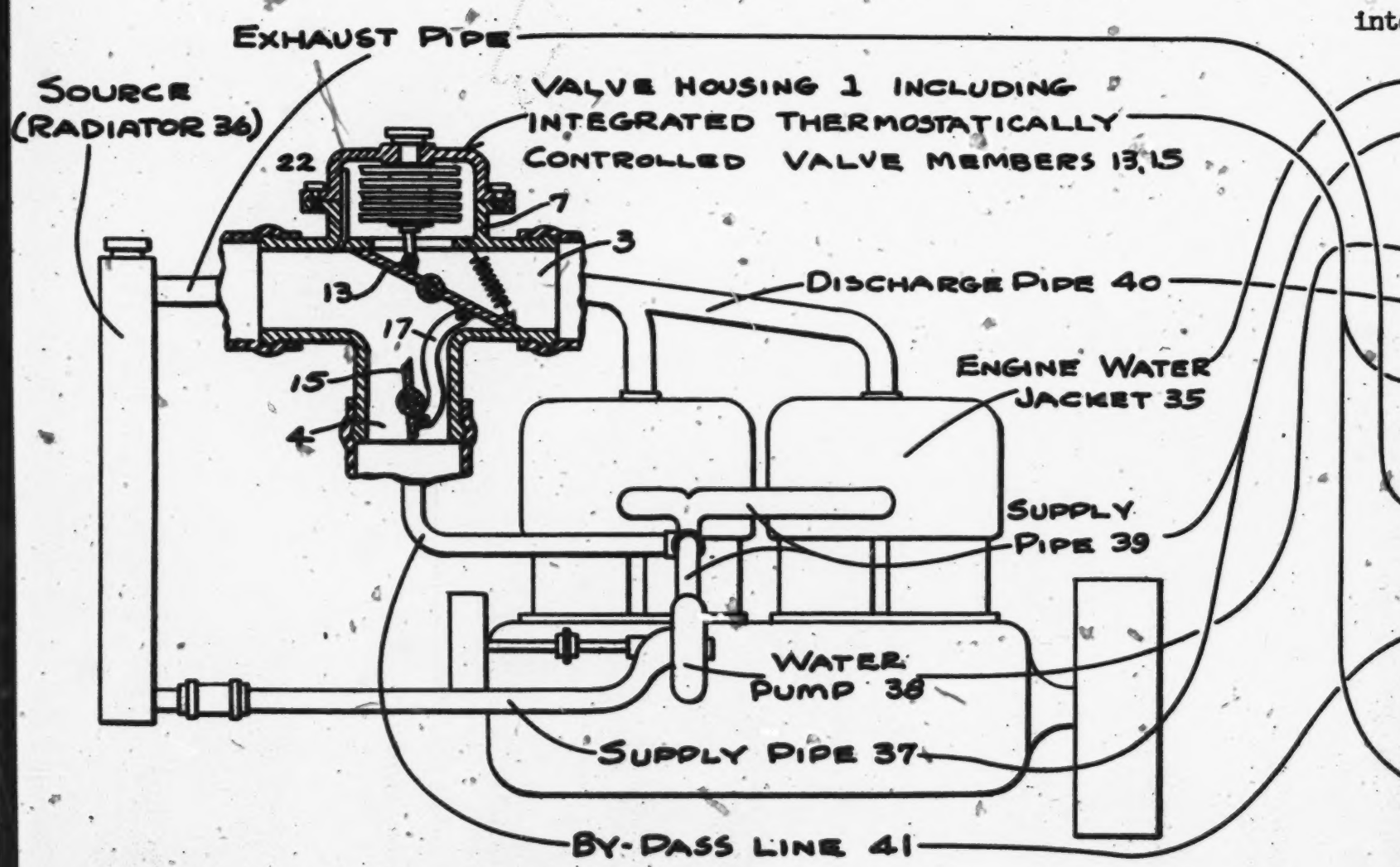
a valve housing provided with a thermostatically controlled valve member connected to the end of said discharge pipe,

an exhaust pipe communicating at one end with said valve housing and extending at its other end to a point of discharge,

a second water line communicating at one end with said first mentioned water line and at its other end with said valve housing member,

said valve capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times.

RESPONSE OF THE DISCLOSURE OF RAYFIELD PATENT 1,528,788 TO CLAIM 3 OF HOLLEY PATENT 2,536,642



RAYFIELD FIG. 1
MODIFIED TO INCLUDE ENLARGED VIEW OF VALVE HOUSING SHOWN IN FIG. 2

CLAIM 3 of HOLLEY PATENT 2,536,642

In a cooling system for a marine internal combustion engine having

a water jacket,

a water line communicating with a source of water supply at one end and with said water jacket at the other end,

a water pump in said line,

a water discharge pipe in said jacket,

a valve housing provided with a thermostatically controlled valve member connected to the end of said discharge pipe,

an exhaust pipe communicating at one end with said valve housing and extending at its other end to a point of discharge,

a second water line communicating at one end with said first mentioned water line and at its other end with said valve housing member,

said valve capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times.

Jan. 2, 1951 D. A. HOLLEY 2,536,642

METHOD OF AND MEANS FOR CONTROLLING THE COOLANT OF MARINE INTERNAL-COMBUSTION ENGINES

Filed Sept. 10, 1949

Fig. 1.

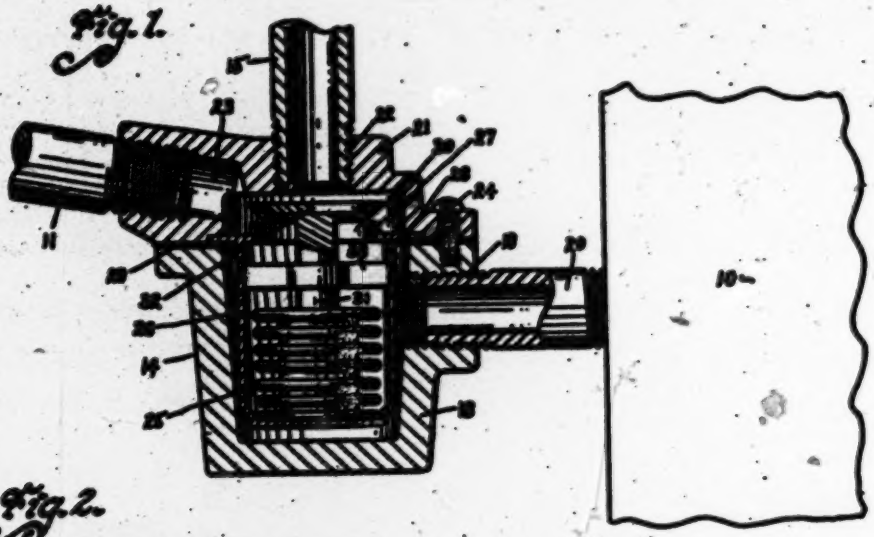


Fig. 2.

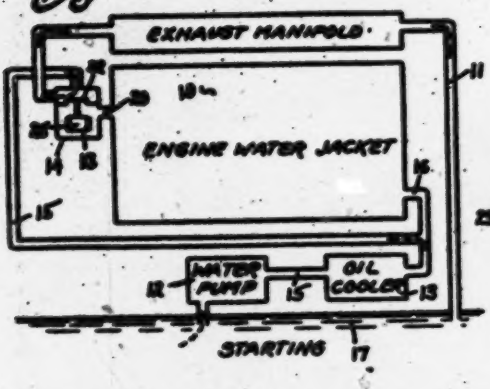


Fig. 3.

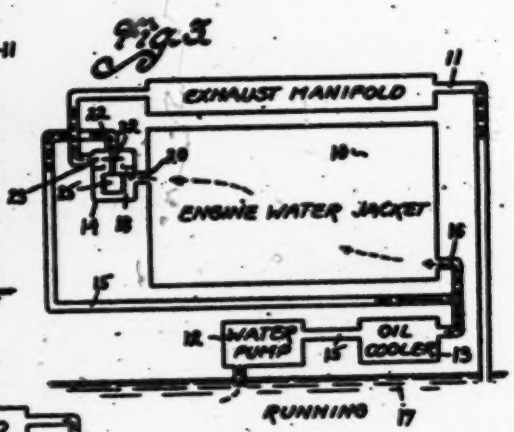
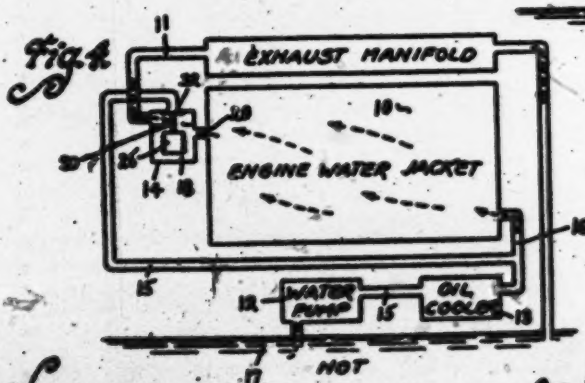


Fig. 4.



Witness
Chas. Pinkney

Inventor
Donald A. Holley
By M. Talbert Dietz
Attorney

Patented Jan. 2, 1951 2,536,642

UNITED STATES PATENT OFFICE

2,536,642

METHOD OF AND MEANS FOR CONTROLLING THE COOLANT OF MARINE INTERNAL-COMBUSTION ENGINES

Donald A. Holley, Waverly, Iowa

Application September 19, 1946, Serial No. 697,932

3 Claims. (Cl. 123—41.08)

1

My invention relates to a method of and means for regulating the flow and temperature of a coolant used in a marine internal combustion motor. This is done by an arrangement of pipes having a thermostatically controlled valve that are designed to maintain a uniform temperature in the water jacket on the motor and at the same time to prevent any sudden flow of cold water or the like into the water jacket when the motor is hot.

In the operation of marine engines, water for the cooling system is drawn from the body of water in which the boat containing the engine is floated. This water is generally very cold and when it is drawn into a hot engine serious damage can result thereto. Most engines have thermostats that open and close at predetermined temperatures. However, once the engine temperature reaches a designated point, the thermostat will open and permit a rush of cold water into the engine. As soon as the temperature drops to a fixed degree the thermostat will close to allow the water in the cooling system to heat. Then, most present cooling systems operate by merely stopping and starting the flow of cold water from the lake, ocean or the like into the water jacket surrounding the engine.

Another problem in present type cooling systems having the ordinary thermostat just referred to arises when the motor is started. Here, the motor being cool, the thermostat is naturally closed and cold water is pumped directly into the water jacket. There it cannot circulate until it is heated sufficiently to open the thermostat. This cold water thus prevents the motor from operating efficiently until the water is heated. Very often in this regard it will be found that a marine engine that has been turned off for some time will have only a small amount of water in the cooling system because it is known that water tends to leak out of this type engine when they are not operating. When this condition exists, substantially the entire cooling system will be filled with cold water when the engine is started which prolongs the time before the engine will operate efficiently.

It is an object of my invention to provide a method of and means for circulating water in the cooling system of a marine internal combustion motor that will control the flow of cold water into the cooling system when the motor is started so that the motor can more quickly attain its most efficient operating temperature, due to the fact that cold water fills the cooling system slowly rather than quickly.

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A further object of my invention is to provide an arrangement of pipes in the cooling system of a marine motor whereby when the motor is first started, a substantial part of the cold water drawn through the pump by-passes the water jacket and thereby allows the engine to quickly attain its most efficient operating temperature and also permits water to flow through a water jacket for cooling the oil for the engine irrespective of whether water flows through the engine water jacket or not.

A still further object of this invention is to provide a thermostatically controlled valve in the cooling system of a marine motor that during the normal operation of the motor will permit a reduced flow of hot water from the water jacket which is compensated for by a reduced flow of pumped cold water into the water jacket and thereby maintaining a uniform operating temperature of the water in the cooling system and also preventing any sudden release of hot water from, or any sudden entrance of cold water into the water jacket.

A still further object of this invention is to provide a thermostatically controlled valve as above referred to that when the water in the cooling system of a marine engine becomes too hot, will permit a steady unrestricted flow thereof from the water jacket to a point of discharge, and which flow will be compensated for by a steady incoming flow of cold water and which thermostatic control will reduce the respective outgoing and incoming flows as the temperature in the water jacket is reduced.

A still further object of my invention is to provide a method of and means for regulating the flow of water and temperature thereof in the cooling system of a marine engine that is economical in manufacture, efficient in use and durable in construction.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a cross-sectional view of my thermostatically controlled valve shown in connection with the water jacket of a marine engine.

Fig. 2 is a diagrammatic view showing my arrangement of the valve in Fig. 1 in the cooling system of an engine and further illustrating the

position of the valve and the flow of water when the engine is cool and about to be started.

Fig. 3 is a diagrammatic view similar to Fig. 2 but showing the position of the valve and the flow of water when the engine is operating at its normally efficient temperature, and

Fig. 4 is a diagrammatic view similar to Fig. 2 and Fig. 3 but showing the position of the valve and the flow of water when the temperature of the coolant in the cooling system of the engine is above that required for normal operation.

In the diagrammatic drawings I show a water jacket 10, exhaust line 11, water pump 12, oil cooler 13, and a valve member 14 which represents part of the elements in the cooling system for a marine engine with which my invention is concerned. A water feed line 15 extends from the pump 12 through the oil cooler 13 to the valve 14. The line 15 also extends into the water jacket 10 by means of the line portion 16 and the pump 12 is designed to communicate with a source of water such as 17.

The valve member 14 is shown in cross-section in Fig. 1. In this valve the numeral 18 designates a housing member provided with the side threaded opening 19 that is designed to receive the short pipe length 20. The outer end of the pipe 20 communicates with the water jacket 10, as shown in Fig. 1.

A cover member 21 provided with a top opening 22 and a side opening 23 is detachably secured to the top of the housing 18 in any suitable manner such as by the stud screw 24. Each of the openings 22 and 23 communicate with the inside of the housing 18 and the opening 23 is positioned on the opposite side of the valve unit 14 to the opening 19, as shown in Fig. 1. The exhaust line 11 is threaded into the side opening 23 and the water feed line 15 is threaded into the top opening 22.

A bellows type expandable thermostat 25 placed within a U-shaped support bar 26 is mounted within the housing 18. A collar member 27, provided with the circumscribing flange 28 is secured to the open end portion of the U support 26 so that the flange 28 extends laterally at right angles to the support bar 26 to form a lip portion that rests on the top of the housing 18 above the gasket 29, as shown in Fig. 1. Thus arranged the opening 30 formed by the collar 27 provides a passageway into and out of the portion of the housing 18 containing the thermostat 25.

Secured to the bellows 25 and movable therewith is the shaft 31 which has the valve disc head 32 on the top thereof. The shaft 31 extends through and is girded by the cross bar 33. The bottom of the disc 32 is capable of seating in the opening 30 at times and the top of the valve disc 32 is capable of seating in the opening 22 at times.

When the water flow pipes and thermostatic valve are arranged as described, in the cooling system for a marine motor, the flow and temperature of the water can be controlled as follows:

When a motor has cooled from sitting idle the position of the valve 14 is shown in Fig. 1. Here the opening 30 into the main portion of the housing 18 is closed by the valve disc 32 because the motor being cool, the bellows 25 are in a contracted position. This closed position of the valve 14 is further illustrated in Fig. 2 where it is apparent that as long as the valve 14 is closed, no water can pass from the water jacket 10 to the exhaust line 11. When the motor is about to be started there may be some water in the water jacket but it is unlikely that it is full since in marine type engines there is usually a leakage from the jacket when the motor is idle. Consequently, if when the motor is started, the jacket is quickly filled with cold water 17, there would be a longer time interval before an operating temperature is reached than if the water entered the jacket slowly. This slow flow of water 17 into the jacket 10 is one of the improvements I have accomplished. As the motor is started, the pump 12 of course, begins to operate and water is pumped through the feed line 15. Because one outlet from the jacket 10 is closed, due to the position of the valve 14, very little, if any, water will pass through the pipe portion 16 into the jacket. Instead, however, it will flow through the pipe 15, thence through the opening 22 and out the opening 23 to the exhaust line 11.

In this way the cold water will by-pass the water jacket initially and as this water passes through the openings 22 and 23 as illustrated by the arrows in Fig. 2 it will have a tendency to cool the valve 14 so as to maintain it in closed position. In the meantime, the engine is running with little, if any water in the jacket and no perceptible amount of cold water entering the jacket so that it will tend to quickly reach its most efficient operating temperature.

At this point it is noted that the thermostatic valve 14 is positioned close to the water jacket 10 by means of the short pipe length 20. The purpose of this is to place the valve 14 where it can be actuated by heat from the engine. Thus as soon as the heat from the engine reaches a predetermined temperature the bellows 25 will expand so that the valve disc 32 rises to the position shown in Fig. 3. As this occurs an outlet is provided from the water jacket 10, through the opening 30 to the opening 23 into the exhaust line and at this time the water 17 will flow not only through pipe 15 but also through the pipe portion 16 into the water jacket.

However, because of my arrangement of the pipes in this cooling system, no sudden full pressure flow of cold water enters the water jacket since a part of the flow as above stated by-passes the jacket, as shown in Fig. 3. A portion of the water from the pump flows through pipe 15 into the valve 14 so that the valve is subjected to hot water from the engine and cold water from the pump. Thus the mean temperature in the valve is sufficient to partially open the passageways at 30 and 22 but neither cold nor hot enough to entirely open or close either completely. Consequently, the flow of hot water out of the jacket at opening 30 is restricted and likewise the flow of cold water into the jacket at line 16 is correspondingly limited so that a uniform operating temperature can more efficiently be maintained.

It is important to observe that the location of the oil cooler 13 is such that the oil will be cooled whether water is flowing into the engine water jacket or not.

Should the water in the engine water jacket become too hot, the bellows 25 will extend until the opening 22 is closed by the valve head 32, as shown in Fig. 4. This will permit an unretarded flow of hot water from the jacket to the exhaust and at the same time stop the flow of cold water from the pump into the valve 14. Obviously, then a greater supply of cold water will enter the jacket 10 through the pipe portion 16. This will quickly reduce the excessive temperature of the engine and as soon as it is reduced to normal heat the bellows will contract sufficiently to assume the

position shown in Fig. 3 and operate as previously described.

From the above description it is apparent that my method and means for controlling the temperature of the water in the cooling system of a marine engine accomplishes a result analogous to that of a mixing faucet through which water flows into a container. Instead of the present type of thermostatically controlled water lines that open and shut to allow a full flow of hot water out of, and a full flow of cold water into, a water jacket at times, my invention permits a controlled flow of exc[illegible]ively hot water out of the jacket and at the same time allows a compensating controlled flow of cold water into the jacket so that a mean determined temperature can be maintained and thus preventing any sudden undue variations in the temperature of the water in the engine jacket.

Some changes may be made in the construction and arrangement of my method of and means for controlling the coolant of a marine internal combustion motor without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a cooling system for a marine internal combustion engine having a water jacket, a water line communicating with a source of water supply at one end and with said water jacket at the other end, a water pump in said line, a water discharge pipe in said jacket, a thermostatically controlled valve member connected to the end of said discharge pipe, an exhaust pipe communicating at one end with said valve and extending at its other end to a point of discharge, and a second water line communicating at one end with said first mentioned water line and at its other end with said valve member.

2. In a cooling system for a marine internal

combustion engine having a water jacket, a water line communicating with a source of water supply at one end and with said water jacket at the other end, a water pump in said line, an oil cooling water jacket in said water line intermediate said pump and said engine water jacket; a water discharge pipe in said jacket, a thermostatically controlled valve member connected to the end of said discharge pipe, an exhaust pipe communicating at one end with said valve and extending at its other end to a point of discharge, and a second water line communicating at one end with said first mentioned water line and at its other end with said valve member.

3. In a cooling system for a marine internal combustion engine having a water jacket, a water line communicating with a source of water supply at one end and with said water jacket at the other end, a water pump in said line, a water discharge pipe in said jacket, a valve housing provided with a thermostatically controlled valve member connected to the end of said discharge pipe, an exhaust pipe communicating at one end with said valve housing and extending at its other end to a point of discharge, and a second water line communicating at one end with said first mentioned water line and at its other end with said valve housing member; said valve capable of controlling the flow of water through said discharge pipe at times and also capable of controlling the flow of water through said exhaust pipe and said second mentioned water line at times.

DONALD A. HOLLEY.

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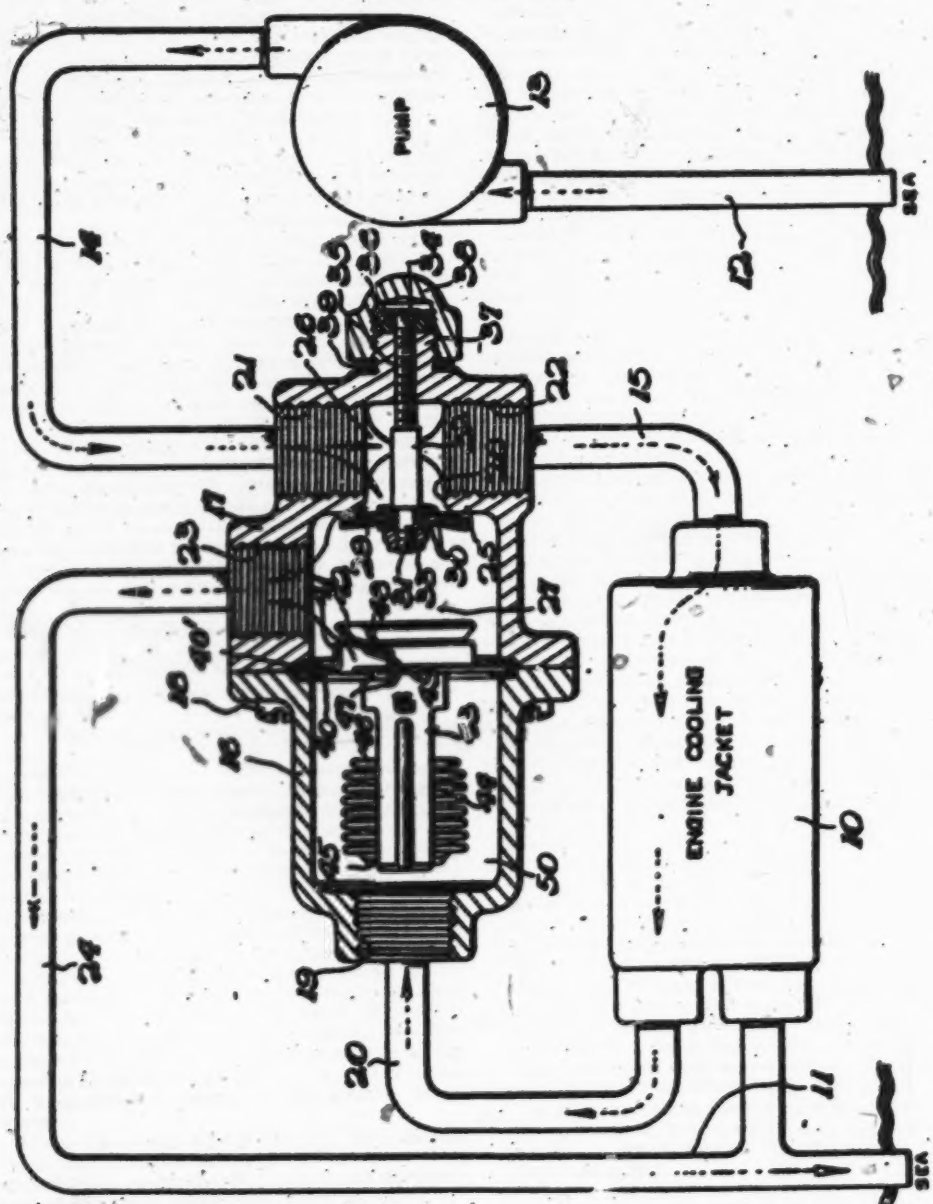
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TEMPERATURE REGULATOR FOR INTERNAL-COMBUSTION ENGINES

Filed March 10, 1947



Inventor

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by Cameron, Kerkam & Sutton

Attorneys

Patented May 31, 1949 2,471,533

UNITED STATES PATENT OFFICE

2,471,533

TEMPERATURE REGULATOR FOR INTERNAL-COMBUSTION ENGINES

David L. Morgan, Bridgeport, Conn., assignor to Robertshaw-Fulton Controls Company, a corporation of Delaware

Application March 10, 1947, Serial No. 733,642

6 Claims. (Cl. 123—178)

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This invention relates to a temperature regulator for the cooling system of an internal combustion engine of the marine type, the term "marine engine" being used herein to embrace any suitable internal combustion engine used for propelling boats or comparable vehicles on water whether fresh or salt.

Temperature regulators have long been used for maintaining a predetermined range of temperature in the cooling medium circulating through the cooling systems of internal combustion engines employed for propelling land vehicles, but in such systems the same cooling medium is circulated through the cooling system over and over again, so that the function of the temperature regulator is merely to establish and maintain within a predetermined range the temperature desired in the water circulating back and forth into and out of the engine jacket and a radiator associated with the circuit. In the case of marine engines, on the other hand, the cooling water is taken from the body of water in which the boat is disposed, and after circulation through the engine jacket, it is returned to that body of water, usually after being passed into heat interchanging relationship with the exhaust pipe of the engine so as to prevent overheating of the latter. As the cooling system must function satisfactorily when the engine is operating at full load when the source of water may be of summer temperature, it follows that when the engine is operating at less than full load or when the water is at cooler temperatures, the engine is overcooled because of the passage of excessive quantities of cooling medium through the engine jacket.

If the temperature of the engine can be kept within closely predetermined limits, many advantages are obtained in smoother and less noisy operation, more complete combustion and less carbon formation, higher compression, better lubrication, higher efficiency, longer engine life, etc.

It is an object of this invention to provide the cooling system of a marine engine of the internal combustion type with an improved temperature regulator which will control the flow through the engine jacket of water derived from the body in which the boat is disposed so as to maintain the temperature of said medium within closely predetermined limits under varying temperatures of the cooling water, varying loads on the engine, etc.

Another object of this invention is to provide a temperature regulator of the type characterized

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which assures that cooling water is at all times flowing in heat interchanging relationship with the exhaust pipe so as to prevent overheating of the same.

Another object of this invention is to provide a temperature regulator of the type characterized which is of relatively simple construction, easily fabricated and installed, and certain in operation.

Other objects will appear as the description of the invention proceeds.

The invention is capable of receiving a variety of mechanical expressions only one of which is shown on the accompanying drawing, but it is to be expressly understood that the drawing is for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Referring in detail to the accompanying drawing, a temperature regulator embodying the present invention is shown in association with a cooling system for a marine engine of the internal combustion type, the engine and cooling system being represented only schematically.

Referring to the drawing, 10 designates the jacket of an internal combustion engine of any suitable size, character and construction, the exhaust pipe of said engine being designated 11. As usual with marine engines of the internal combustion type, water is withdrawn from the body of water in which the boat is disposed through an intake pipe 12 leading to a pump 13 of any suitable size and character but conventionally of such capacity as to provide an adequate circulation of water when the engine is operating at full load under summer conditions. The outlet of the pump is in communication through conduits 14 and 15 with the inlet to the engine jacket 10. Interposed between the conduits 14 and 15 is a temperature regulator embodying the present invention as now to be described.

As illustrated, the regulator comprises a housing composed of two sections 16 and 17 secured together in any suitable way as by a plurality of screws or bolts 18 passed into or through suitable flanges of said sections. Section 16 of the housing has an inlet opening 19 in association with which is secured in any suitable way the outlet end of a conduit 20 that, at its opposite end, is in communication with the outlet of the engine jacket 10. Section 17 of said housing is provided with a pair of openings 21 and 22, preferably in alignment, in association with which is secured in any suitable way the outlet of the conduit 14

and the inlet of the conduit 15. Section 17 of the housing is also provided with a third opening 23 in association with which is secured in any suitable way the inlet to a conduit 24 that preferably leads the cooling water from the jacket into heat interchanging relationship with the exhaust pipe 11 in any suitable way and only indicated diagrammatically in the drawing, after which it is returned to the body of water in which the boat is disposed.

Internally of the section 17 of said housing a partition 25 separates the interior into a passage 26, which connects the openings 21 and 22, and a chamber 27. Said partition 25 is provided with a suitable aperture 28 between the passage 26 and the chamber 27, and cooperating with the valve port thus formed is a pressure operated valve member shown as composed of a flexible disk 29 of any suitable material stationarily retained in position at its central portion between a pair of washers 30 on a stem 32 having a threaded extremity 31 on which a lock nut 33 is secured to lock said valve disk in position. Valve disk 29 is preferably made of an elastic or resilient material to operate as hereinafter explained, but if preferred a coil spring of any suitable construction may cooperate with said valve disk to provide the requisite resiliency for operation as described. Stem 32 has its opposite end 34 provided with threads for reception in a threaded aperture 35 extending through the outer wall of the housing where said stem is adjustably locked in position by a jam nut 36 cooperating with said threaded end 34. The exterior wall of the housing may be provided with a threaded boss 37 surrounding the aperture 35 and an acorn nut 38 may be threadedly mounted on said boss 37 to enclose the jam nut 36, a gasket 39 being preferably interposed between the acorn nut 38 and the wall of the housing so as to minimize corrosion.

Mounted within the housing, to the left of the partition 25 as shown in the drawing, is a thermostatically operated valve of any suitable construction. As shown, said thermostatically operated valve is secured in position between the flanges on the two sections 16 and 17 of the housing, and to this end said valve is shown as including a disk-like member 40 which is received in U-shaped grommet 40' secured between the flanges of the housing sections 16 and 17, said grommet being of any suitable material so as to minimize electrolytic corrosion. Member 40 is shown as having a right angularly extending circular flange 41 surrounding a valve port 42. Secured to said member 40 in any suitable way, or formed integrally therewith, is a U-shaped strap 43, and mounted on said strap is a thermostat 44 having its lateral wall in the form of an expansible and collapsible corrugated tubular wall or bellows, said thermostat having a stationary end wall 45 secured to the base of the strap 43 in any suitable way and having a movable end wall 46 to which is secured a valve stem 47. Mounted on said valve stem in any suitable way is a cup-shaped valve member 48 positioned for cooperation with the seat provided by the extremity of the flange 41 around port 42. The thermostat 44 is charged with any suitable volatile fluid so that it will expand and contract under variations of temperature in a manner well understood in the art and move the valve member 48 away from or toward the seat 41 at predetermined temperatures intended for the particular engine whose cooling system is to be controlled. Valve member 48 is shown as provided with one or more apertures 49 for a purpose to be explained, although if preferred the aperture or apertures could be formed in the member 48 or the flange 41.

By appropriately selecting the size, material and construction of the pressure operated valve 29 said valve may be so formed as to provide predetermined flows of cooling fluid from the passage 26 into the chamber 27 for predetermined variations of fluid pressure in the passage 26. This range of pressures can be adjusted by moving the stem 32 in the aperture 35, after which the stem can be locked in position by the jam nut 36.

When the engine is in operation and driving the pump 13, water from the body of water in which the boat is disposed is drawn through pipe 12 and delivered through conduit 14, passage 26 and conduit 15 to the cooling jacket 10, from which it may flow through the conduit 23 into the chamber 50 in which is disposed the thermostat 44. When the engine is first started the water so passed through the cooling jacket will be relatively cool so that the thermostat 44 will be contracted, holding the valve member 48 on its seat 41. However, a small circulation over the thermostat 44 will be maintained owing to the one or more apertures 49 in the valve member 48, said apertures as to size and number being so selected as to obtain the desired circulation over the thermostat 44. As the valve member 48 is now closed, however, a back pressure will be built up in passage 26. This back pressure acting on the valve member 29 will open the latter proportionately to the magnitude of the back pressure, so that the water being delivered through conduit 14 by pump 13 will largely flow through the port 28 into the chamber 27, and thence through the conduit 24 to the exhaust pipe.

As the temperature of the cooling medium rises due to continued operation of the engine the temperature of the water flowing through chamber 50 will be correspondingly raised until that temperature is reached at which the thermostat 44 is designed to initiate its expansion, whereupon any further rise in the temperature of the water flowing through the chamber 50 will cause the thermostat 44 to expand, opening the valve 48 so as to permit the water flowing through the engine jacket and chamber 50 to flow through the port 42 into the chamber 27, and thence through the conduit 24 to the exhaust pipe. When thereafter the temperature of the water flowing through the chamber 50 starts to decrease the thermostat 44 will correspondingly contract and move the valve member 48 toward its seat, proportionately decreasing the flow of water through the engine jacket.

Thereby the temperature of the water flowing through the engine jacket can be nicely controlled within predetermined limits selected as desirable for the particular engine under regulation. At the same time the volume of water flowing through the port 42 predetermines the back pressure existing in the passage 26 so that the amount of water flowing through the port 28 past the pressure operated valve 29 is generally in inverse proportion to the quantity of water flowing through the engine jacket. Thereby, irrespective of the load on the engine and the temperature of the water being pumped, the temperature of the water in the engine jacket may be nicely controlled so as to be kept within predetermined limits, while at all times an adequate volume of

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water is flowing through the conduit 24 to prevent overheating of the exhaust pipe. The pump may accordingly be given adequate capacity to afford proper cooling of the engine under the most adverse conditions, and even though the pump is thereby delivering a quantity of water in excess of the requirements of the engine cooling system, the portion of the water flowing through the engine jacket is so predetermined as to maintain the desired range of temperature while all excess water flows through the pressure operated valve 29 to the outlet conduit 24 where it is effective in cooling the exhaust pipe.

Thus a temperature regulator having the desired characteristics has been provided to maintain the engine temperature with certainty and efficiency within the desired limits notwithstanding wide variations of load or the temperature of the water available for cooling. At the same time the device is of relatively simple construction so that it is inexpensive to fabricate and install.

While the embodiment of the invention illustrated on the drawing has been described with considerable particularity, it is to be expressly understood that the invention is not restricted thereto, as other embodiments will now be apparent to those skilled in the art, while changes may be made in the details of construction, arrangement, proportion, material, etc., without departing from the spirit of this invention. Reference is therefore to be had to the appended claims for a definition of said invention.

What is claimed is:

1. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, and a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber.

2. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, and means in association with said last named valve for maintaining a predetermined flow of water over said thermostat when said thermostatically operated valve is closed.

3. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, and means for adjusting said pressure responsive valve to predetermine the extent of its opening under variations of pressure in said passage.

4. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, and a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, said pressure responsive valve including a flexible valve disk cooperating with said first named port and variably flexing under variations of pressure in said passage to predetermine the flow of cooling medium through said port.

5. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber for delivering water into heat interchanging relationship with the exhaust pipe of the engine, a valve port between said passage and said outlet chamber, a pressure responsive flexible valve disk cooperating with said port and operable under variations in pressure in said passage for deliver-

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port and responsive to the temperature in said first named chamber, and means in association with said last named valve for maintaining a predetermined flow of water over said thermostat when said thermostatically operated valve is closed.

3. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, and means for adjusting said pressure responsive valve to predetermine the extent of its opening under variations of pressure in said passage.

4. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and operable under variations in pressure in said passage for delivering variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, and a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, said pressure responsive valve including a flexible valve disk cooperating with said first named port and variably flexing under variations of pressure in said passage to predetermine the flow of cooling medium through said port.

5. A temperature regulator for the cooling system of an internal combustion engine of the marine type including an engine jacket and a pump for delivering water from an external source to the engine jacket in excess of the requirements of the cooling system under at least some conditions, a housing providing a passage in communication with said pump and with the inlet of the engine jacket, said housing also providing a chamber in communication with the outlet of the engine jacket and an outlet chamber, an outlet conduit in communication with said outlet chamber for delivering water into heat interchanging relationship with the exhaust pipe of the engine, a valve port between said passage and said outlet chamber, a pressure responsive flexible valve disk cooperating with said port and operable under variations in pressure in said passage for deliver-

ing variable quantities of water to said outlet chamber, a valve port between said first named chamber and said outlet chamber, and a thermostatically operated valve cooperating with said last named port and responsive to the temperature in said first named chamber, said thermostatically operated valve predetermining the pressure in said passage effective to operate said pressure responsive valve disk and maintain substantially the same water flow into heat interchanging relation with said exhaust-pipe whether said thermostatically operated valve is open or closed.

6. A temperature regulator for the cooling system of an internal combustion engine of the marine type including a housing provided with a passage having an inlet adapted to be connected to a pump and an outlet adapted to be connected to the inlet of an engine jacket, said housing also providing a chamber having an inlet adapted to be connected to the outlet of the engine jacket and an outlet chamber having an outlet adapted to be connected to an outlet conduit, a valve port between said passage and said outlet chamber, a pressure responsive valve cooperating with said port and including a flexible valve disk which is variably flexible under variations of pressure in said passage to predetermine the flow of medium through said port, a second valve port between said first named chamber and said outlet chamber, a valve member cooperating with said second named valve port, and a thermostat subjected to the temperature in said first named chamber and operatively connected to said last named valve member.

DAVID L. MORGAN.

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J. V. GIESLER

ENGINE COOLING SYSTEM

Filed Aug. 19, 1916

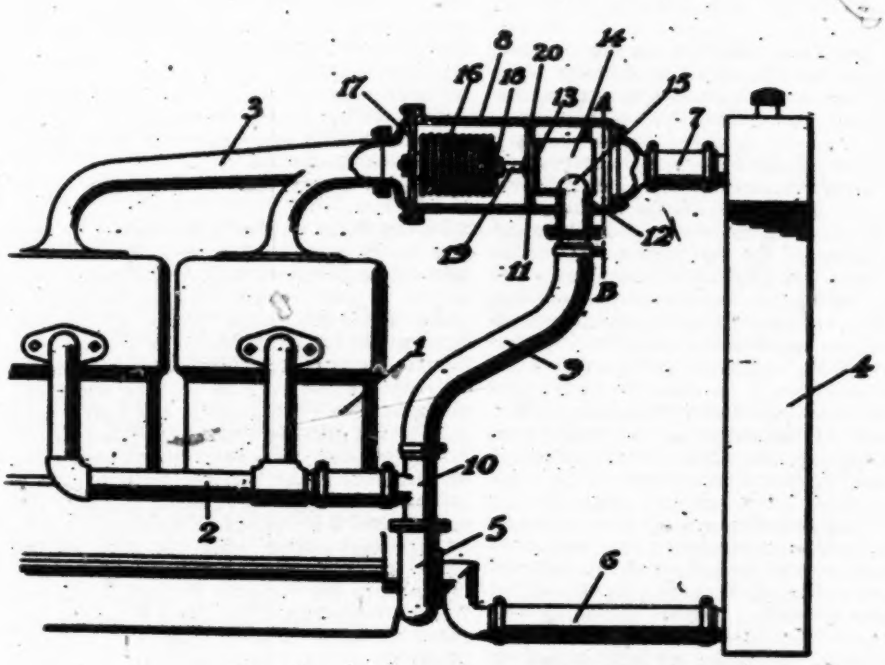


Fig. 1.



Fig. 2.

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James V. Giesler

By Munn, Cameron, Davis & Mason

Attorneys

Patented Nov. 10, 1925. 1,561,153

UNITED STATES PATENT OFFICE.

JUAN V. GUERLER, OF KNOXVILLE, TENNESSEE, ASSIGNOR TO THE FULTON COMPANY, OF KNOXVILLE, TENNESSEE, A CORPORATION OF MAINE.

ENGINE-COOLING SYSTEM.

Application filed August 19, 1924. Serial No. 113,265.

To all whom it may concern:

Be it known that I, JUAN V. GUERLER, a citizen of the United States of America, and a resident of Knoxville, Tennessee, have invented a new and useful Improvement in Engine-Cooling Systems, which invention is fully set forth in the following specification.

This invention relates to an engine cooling system, particularly a system for cooling internal combustion engines such, for example, as are ordinarily used in automobiles.

An object of this invention is to provide an improved system of the type referred to wherein likelihood of the cooling medium freezing in the radiator is lessened by utilization of the fact that a fluid while in motion is less likely to freeze than while not in motion. A further object of this invention is to provide an improved system of the type characterized wherein a continuous circulation of the cooling medium is maintained through the radiator of the system, and the circulation through the jacket or jackets of the engine is controlled and proportioned to the needs of the system as determined by the temperature of the cooling medium. Other objects relate to the provision of a cooling system that is simple and compact in construction, inexpensive to manufacture and install, and efficient in operation. Stated broadly, the invention comprises a cooling system including the engine jacket or jackets, a radiator, a conduit between the outlet of said jacket or jackets and the inlet of said radiator, a pump communicating with the outlet of said radiator and having connections with said conduit and the inlet of said jacket or jackets, valve mechanism for respectively controlling the circulation of cooling medium through said jacket or jackets and the connections around the same, and thermosensitive means, preferably subjected to the temperature of said cooling medium as it leaves the engine jacket or jackets, for actuating said valve mechanism to permit circulation of the cooling medium through said jacket or jackets only when said medium has attained a predetermined temperature, although circulation of cooling medium is maintained through the radiator all of the time that the engine is running.

The invention is susceptible of embodiment in a variety of mechanical forms, one of which, for the purpose of illustration, has been shown on the accompanying drawing. But it is to be expressly understood that such drawing is for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

In the drawing,

Fig. 1 represents an elevation, partly in section, of an internal combustion engine provided with a cooling system embodying the present invention.

Fig. 2 is a cross section on the line A—B of Fig. 1.

In the form shown, 1 represents an engine as the usual or any preferred form of internal combustion engine commonly employed in automobiles. The engine is provided with the usual jacket or jackets through which is circulated a cooling medium to maintain the cylinders at the proper temperature for the most efficient operation of the engine. 2 represents the inlet manifold to the jackets, and 3 the outlet manifold therefrom. 4 is any conventional form of radiator, 5 any suitable form of pump for maintaining a circulation through the system, and 6 a conduit connecting the outlet of the radiator with the inlet of the pump, the manifold 3 communicating with the inlet to the radiator through a conduit 7 and a valve housing 8. 9 is a conduit between the valve housing 8 and a T-coupling 10 which is also connected with the outlet of the pump and the inlet of the manifold 2.

Means are provided for controlling the circulation of the cooling medium through the engine jacket or jackets, and the conduit. To this end the valve housing is provided with a valve port 11 for controlling outflow of the cooling medium from the engine jacket or jackets, and a valve port 12 for controlling flow of the cooling medium through the conduit 9. Any suitable type of valve may be employed. In the form shown the valve member 13, adapted to close port 11, has connected therewith, preferably integrally, a piston valve member 14 provided with an opening 15 which may register with the valve port 12 when valve port 11 is closed by member 13.

Thermosensitive means are provided for actuating the aforesaid valves, such means

preferably taking the form of a thermosensitive device positioned in the path of the cooling medium as it leaves the engine jackets. While any suitable form of thermosensitive means may be employed the preferred construction comprises an expansible and collapsible vessel 16 mounted within the valve housing 8, as by a bracket 17, and having its movable end wall 18 connected to the aforesaid valves by a stem 19. This expansible and collapsible vessel 16 is adapted to be collapsed against an elastic force, and is preferably constructed of a resilient metal so that the same is possessed of an inherent elasticity, and such vessel is charged with a thermosensitive or volatile fluid, preferably at a pressure below that to which the vessel is normally exteriorly subjected. The elasticity inherent in or acting on such vessel is of itself sufficient to operate the valves 13 and 14 whereby, upon equalization of the pressure within and without the vessel, as would happen if a leak occurred in the vessel, the elastic force will cause an expansion of the vessel, move valve 13 to wide open position, thereby providing for a maximum circulation through the jacket or jackets of the engine to prevent overheating of the same.

In order that there shall be all all times a small circulation of the cooling medium past the thermosensitive device, a small aperture 20 is preferably provided in the partition constituting the seat of valve 13, and forms a by-pass around the valve 13.

When the engine is started, the cooling medium of the system will normally be at the same temperature as the outside air. The expansible and collapsible vessel 16 will accordingly be contracted, maintaining valve port 11 closed and aperture 15 in register with port 12, whereby conduit 9 is in complete communication with the radiator 4. Pump 5 will then withdraw the cooling medium from the radiator 4 through conduit 6, and deliver the same through T-coupling 10, conduit 9, opening 15 and conduit 7 back to the radiator. Thereby is maintained a circulation of the cooling medium through the radiator, and such medium, being in motion, is less likely to freeze in the radiator than if it stood stationary therein. The friction of the cooling medium on the walls of the passages through the conduits and radiator, and the energy of the pump expended in churning such medium, etc., also tend to increase the temperature of said cooling medium to prevent freezing thereof. Owing to the aperture 20, there will also be a small circulation through the jacket or jackets past the thermosensitive device 16, and this medium heated in its passage through said jacket or jackets will be delivered to and mingle with the medium circulation through the radiator 4 and conduit 9, slightly raising the temperature thereof.

As soon as the temperature of the medium in the jacket or jackets rises to a degree proper for the most efficient operation of the engine, and at which degree the thermosensitive device is designed to become responsive, the expansible and collapsible vessel 16 will begin to expand, proportionately opening valve port 11 and moving aperture 15 out of register with port 12, thereby proportioning the circulation through the jacket or jackets and the connections there around conduit 9 in accordance with the needs of the system as determined by the temperature of the medium leaving the jacket or jackets. A continued rise in temperature of the medium will cause further expansion of the vessel until eventually the valve port 11 is wide open and valve member 14 entirely closes port 12. It is therefore seen that a cooling system has been provided wherein a circuit is maintained which includes a radiator and either the engine jacket or jackets or connections around the jacket or jackets, together with valve means automatically controlled for proportioning the circulation through the jacket or jackets and the connections thereabout in accordance with the needs of the system, a continuous circulation of the cooling medium being maintained through the radiator at all times.

While the illustrated embodiment has been described in considerable detail, it is to be expressly understood that the present invention is not to be restricted to the precise form shown on the drawing, as it is capable of receiving a variety of mechanical expressions, some of which will readily suggest themselves to those skilled in the art, while certain features thereof are capable of use without other features thereof. Reference is therefore to be had to the claims hereto appended for a definition of the limits of the invention.

What is claimed is:

1. In a cooling system for an internal combustion engine, in combination with the engine jacket or jackets, a radiator, a conduit leading from the outlet of said jacket or jackets to the inlet of said radiator, a circulating pump, a conduit leading from the outlet of said radiator to the inlet of said pump, a conduit leading from the outlet of said pump to said first-named conduit, connections from the outlet of said pump to the inlet of said jacket or jackets, valve mechanism for respectively controlling the flow of cooling medium through said last-named conduit and said jacket or jackets, and thermosensitive means for actuating said valve mechanism to permit circulation of said cooling medium through said jacket or jackets only when

said medium has attained a predetermined temperature, said thermosensitive means comprising an expansible and collapsible vessel normally contracted against an elastic force and charged with a thermosensitive fluid at a pressure below that to which it is normally subjected exteriorly so that upon leakage of said vessel it will expand and move said valve mechanism to a position permitting circulation of the cooling medium through said jacket or jackets.

2. In a device of the class described the combination of a radiator, an engine water jacket, an upper conduit connecting the top of the water jacket and the top of the radiator, an inlet pipe connecting the bottom of the water jacket and the bottom of the radiator, a by-pass conduit connecting the upper conduit and the inlet pipe, a main valve in the upper conduit operable by a thermostat to interrupt communication from the top of the water jacket and to the radiator and by-pass, and an auxiliary valve for the by-pass adapted to open when the main valve closes.

3. In a device of the class described the combination of a radiator, an engine water jacket, an upper conduit connecting the top of the water jacket and the top of the radiator, an inlet pipe connecting the bottom of the water jacket and the bottom of the radiator, a pump in the inlet pipe, a by-pass conduit connecting the pump outlet with the upper conduit, a thermostatically operated valve in the upper conduit for interrupting communication from the top of the water jacket to the top of the radiator and an auxiliary valve for the by-pass adapted to open when the main valve closes.

In testimony whereof I have signed this specification.

JEAN V. GIESLER.

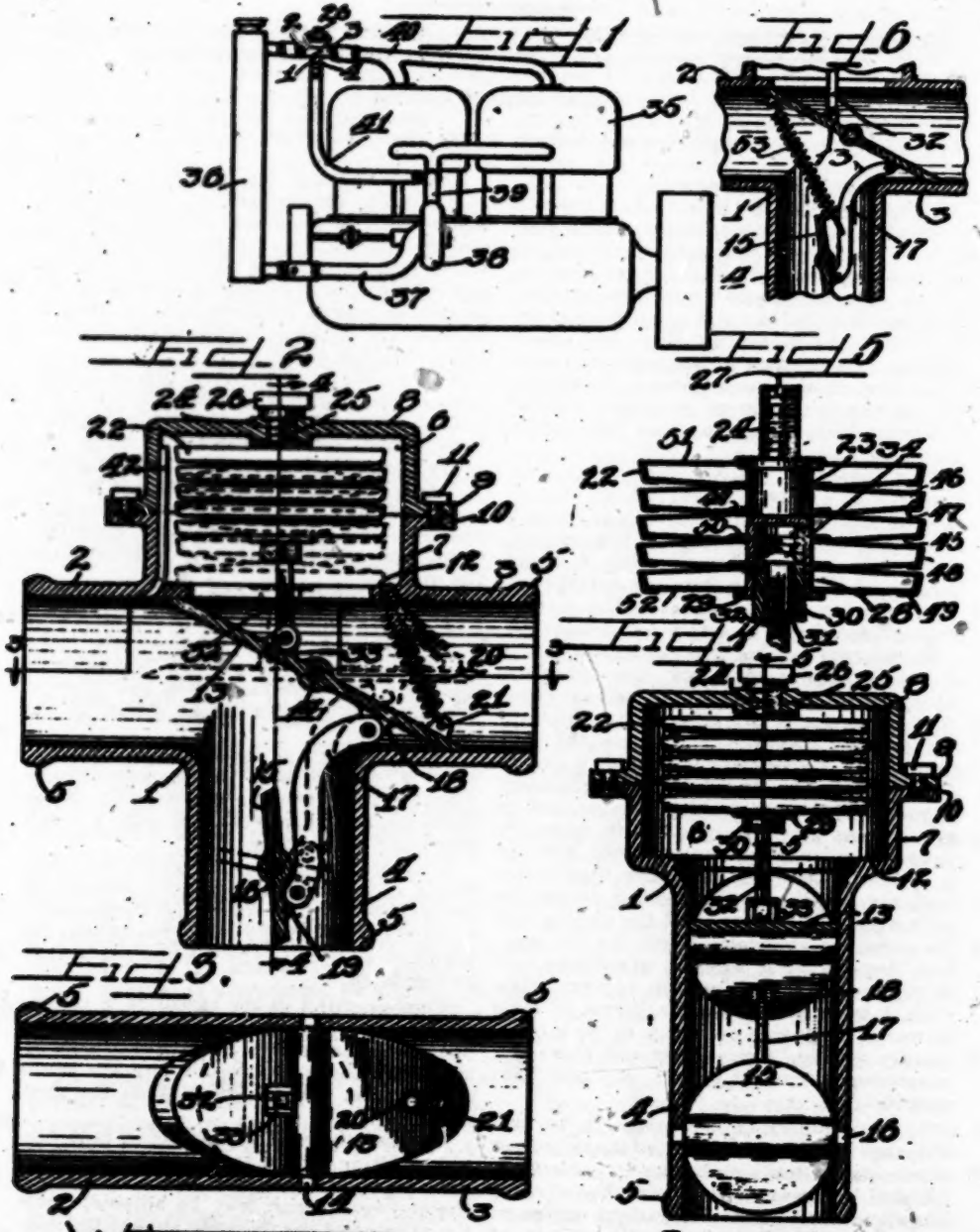
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1,528,788

C. L. RAYFIELD

THERMOSTATIC VALVE

Filed Feb. 6, 1919



Witnesses

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Patented Mar. 10, 1925. 1,528,788

UNITED STATES PATENT OFFICE.

CHARLES L. RAYFIELD, OF CHICAGO, ILLINOIS, ASSIGNOR TO RAYFIELD MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

THERMOSTATIC VALVE.

Application filed February 6, 1922. Serial No. 534,697.

To all whom it may concern:

Be it known that I, CHARLES L. RAYFIELD, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Thermostatic Valve; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention has reference more particularly to a valved fitting which is thermostatically operated and is particularly adaptable for use in engine temperature regulating systems for effecting a rapid heating of the cooling fluid around the engine cylinder and maintaining the cooling fluid uniformly at a certain temperature.

In internal combustion engines, there is a certain temperature of the cylinders, which varies somewhat in the various types of such engines, at which the engine develops the greatest efficiency and gives the best results. It is customary to provide a system for applying a cooling fluid to the cylinders to prevent excessive heating thereof, but as this system must be adapted to serve its purpose under extreme conditions such as in very hot weather, it results that under ordinary conditions its cooling capability is in excess of the needs of the engine and the cylinders are cooled below the temperature for the most efficient operation, and furthermore in starting the engine, when cold, it takes a considerable period of time to warm the engine cylinders up to a satisfactory working temperature and there is a consequent period of erratic and uncertain operation.

It is an object of my invention to provide an improved valved fitting which is thermostatically controlled and particularly adapted to be connected with the cooling system of an internal combustion engine so as to automatically regulate the supply of cooling fluid to the engine cylinders and thereby enable the cylinders to be quickly heated when starting the engine and maintain the cylinders during operation of the engine, at the temperature at which the engine develops its greatest efficiency.

Another object of my invention is to provide a valve for regulating the supply of cooling fluid to the cylinders and a thermostat for controlling the operation of said valve, said valve being adapted in case the controlling ability of the thermostat is impaired, to permit sufficient cooling fluid to be supplied to the cylinders to prevent excessive heating thereof.

Another object of the invention is to provide a fitting with a thermostatically controlled valve which is of simple compact construction and in which the parts are easily accessible for repairs or adjustments.

Another object of the invention is to provide a compact thermostatic element which can be easily and economically manufactured, and which is securely reinforced at the joints.

Another object of the invention is to provide a valve controlling thermostat which is adapted to be separated from the main fluid passageway when the temperature reaches a predetermined point and thereby prevent excessive heating or strain to the thermostat.

Another object of the invention is to provide a fitting with a thermostatically operated valve wherein the opening of the valve is effected quickly and with a small degree of movement.

Another object of my invention is to provide a valve with a thermostatic controlling element, wherein the valve and thermostatic element are adjustably connected so that the operation of the valve by the thermostat may be regulated.

Another object of the invention is to provide a valve and thermostatic element for operating the valve with a pivotal connection therebetween to permit free movement of the valve without strain upon the thermostat.

Another object of my invention is to provide a fitting with a valve and a thermostat for operating the valve, and a connection therebetween which may be adjusted from the exterior of the fitting to change the relative position of the thermostat and valve for regulating the operation of the valve by the thermostat.

Another object of my invention is to provide a fitting with a valved passageway and a thermostat chamber with a duct from the

passageway to the remote portion of the thermostat chamber adapted to provide circulation whereby a uniform temperature is maintained throughout the entire thermostat chamber.

My invention also has other important objects which will appear from the following specification and the accompanying drawings, in which a preferred form of my invention is illustrated and described.

On the drawings:

Figure 1 is a side view of an automobile or other similar engine having my thermostatic valve fitting connected in the circulating system.

Figure 2 is an enlarged vertical longitudinal sectional view through the fitting.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 2, with the parts thereof shown in elevation.

Figure 5 is a sectional view through the thermostatic element on the line 5—5 of Figure 4.

Figure 6 is a fragmentary sectional view of a fitting illustrating a modified form of detail.

As shown on the drawings:

The fitting or casing is indicated generally at 1, and has the opposite aligning apertured branches 2 and 3, and the intermediate branch 4, each of which is adapted to have connections made therewith, and in the present instance are provided for this purpose with heads 5, at the outer end thereof over which a hose is adapted to be telescoped and clamped thereon as shown in Figure 1. At the top of the fitting, opposite the branch 4, is a thermostat chamber 6, which is formed partially by a cylindrical wall 7, at the top of the fitting 1, and partially by a cap 8, which has a flange 9, extending around the edge thereof and secured to the flange 10, at the upper edge of the wall 7, by means of the cap screws 11, and there is an opening from the thermostat chamber 6, to the interior of the fitting 1, which opening is surrounded by a ledge 12, which serves to provide a stop against which the thermostat seats when expanded as hereinafter noted.

An elliptical valve 13, is horizontally pivoted at its minor axis in the fitting 1, intermediate of the branches 2 and 3, so as to close diagonally as shown in Figure 2, and interrupt communication between the branch 3, and the other two branches 2 and 4, and at the same time interrupt communication between the thermostat chamber 6, and the latter branches, and permits communication between the thermostat chamber 6, and the branch 3, at all times. There is also a valve 15, in the branch 4, which is also slightly elliptical in form and pivoted as at 16, at its minor axis so as to close diagonally somewhat as shown by the dotted lines in Figure 2, and this valve is connected to operate with the valve 13, by means of a lever 17, which is bent or angularly formed so as to clear the wall of the fitting. The upper end of the lever is pivoted to lugs 18, on the under face of the valve 13, and the lower end thereof is pivoted to the lugs 19, on the upper face of the valve 15, so that when the valve 13 is closed, the valve 15, will be opened and when the valve 13, is opened the valve 15, will be closed. A spring 20, has one end connected to the wall of the fitting and the other end to the lug 21, on the upper face of the valve 13, so as to normally hold the valve 13, open, and requires closing of the valve against the tension of the spring.

For automatically operating the valve 13, there is a thermostat 22, which is mounted in the chamber 6, and connected with the valve 13, so as to open and close the valve 13, and 15, proportionately to the temperature of the fluid applied to the thermostat.

This thermostat 22, as shown in Figure 5, consists of a series of hollow disks which communicate with one another through openings 44, at the centers thereof, and contain some fluid, which expands sufficiently at the temperature desired to be maintained, to develop a pressure within the thermostat and expand each hollow disk axially to provide movement for operating the valve 13.

This thermostat element 22, is constructed of pairs of ring shaped disks 45 and 46, the former of which has an axially extending flange 47, at the outer edge thereof for spacing the adjoining disks 45 and 46, and the latter of which has the flange 48, extending axially in the opposite direction, and telescoping the flange 47, and has the edge 49, thereof, turned inwardly so as to clamp the disks 45, and 46, together. For securing the inner edges of the adjoining disks 46 and 47 together, the inner edge of the disk 46, is swaged axially and outwardly as at 50, so as to embrace the inner edge of the disk 45, and clamp the inner edges of the two disks together. This provides a secure joint for connecting the disks of the thermostat and the joints may also be soldered or otherwise sealed.

The upper and lower end walls or disks 51 and 52, respectively, are attached to the end disks 45 and 46, respectively, by means of flanges 47 and 48, in the same manner as the disks 45 and 46, are connected together, and the upper end wall 51, has the plug 53, secured axially to the inside thereof by soldering or otherwise, and extending inwardly through the openings 44, to afford a stop to limit the contraction of the thermostat.

This plug 53, has a threaded stem 54,

which projects axially and outwardly and is passed loosely through a central opening 25, in the cap 8, of the thermostat chamber, and has the nut 26, threaded on the outer end thereof against the outer face of the cap 8, to hold the thermostat in position. The outer end of the stem 24, is provided with a notch 27, to be engaged by a screw driver or may have any other suitable wrench connection whereby, after loosening the nut 26, the thermostat may be turned to provide adjustment hereinafter described.

The lower disk 22, of the thermostat is provided with a hollow internally threaded sleeve 28, which has the flange 29, at the lower end securely fastened to said lower disk and has the upper end closed and adapted to engage the inner end of the plug 23, to limit the contraction of the thermostat, and there is a plug 30, which has a threaded connection with the interior of the sleeve 28, whereby said plug may be adjusted lengthwise of the sleeve. This plug 30, has a rectangular opening 31, extending axially therethrough to engage a rectangular stem 32, which is pivoted at its lower end to lugs 33, on the upper face of the valve 13, and has the head 34, at the upper end which engages the upper face of the plug 30, to provide a loose link for exerting a pull on the valve. The slot 31, is preferably tapered downwardly or flared in one direction as shown in Figure 5, to permit swinging of the stem therein, and engages the stem so as to be held thereby from turning and therefore when the thermostat 22, is rotated the plug 30, is held from turning and is withdrawn from the sleeve 28, or inserted a further distance therein by reason of its threaded engagement therewith and adjustment is thereby effected for regulating the opening and closing of the valve 13. This adjustment, it will be noted, can be made from the exterior of the fitting by merely loosening the nut 26, and turning the thermostat by means of a screw driver inserted in the notch 27, or by any other connection that may be provided, and after such adjustment the nut 26, is turned down tight against the cover 8, and holds the thermostat in the adjusted position.

This thermostat fitting is adapted to be placed in the circulating system with which internal combustion engines are usually provided for cooling the engine and serves to quickly raise the temperature of the cooling fluid around the engine cylinder to the desired working temperature, and also automatically maintains the temperature around the cylinder at this point.

In the application of my fitting as shown in Figure 1, the numeral 35 indicates an internal combustion engine which may be of any form and 36, a radiator, the lower portion of which is connected by means of the pipe 37, to the inlet side of a pump 38, the outlet pipe 39, from which is connected near the bottom of the engine cylinder jackets. A manifold conduit 40, is connected with the cylinder jackets at the top and leads to the top of the radiator 36, and I have shown my fitting interposed between the manifold 40, and the top of the radiator. This fitting has the branch 3, thereof connected with the manifold 40, and the opposite branch 2, is connected with the top of the radiator so that the valve 13, operates to control communication from the top of the cylinder jackets to the top of the radiator. There is also a by-pass pipe 41, from the outlet pipe 39, of the pump 38, connected with the branch 4, of the fitting, and the arrangement of the valves 13 and 15 is such that when the valve 13 is closed and prevents communication between the cylinder jackets and the radiator, the valve 15, is open and permits the water from the pump to pass through the pipe 41, to the radiator, and thereby enables circulation to be maintained in the radiator.

The valve 13, is normally closed when the engine is started and remains closed until the temperature of the water in the cylinder jacket is raised sufficiently to expand the thermostat 22, in the thermostat chamber, said chamber being at such time in communication with the branch 3, connected with the top of the cylinder jacket. In order to provide circulation in the thermostatic chamber 6, and insure uniform distribution of the heated water throughout the chamber 6, to properly energize the thermostat 22, I have provided a pipe 42, the lower end of which is in communication with the branch 2, and the upper end of which is adjacent the top of the thermostatic chamber 6, so that a limited circulation of water is maintained from the branch 3, to the top of the thermostat chamber, and to the branch 2 when the valve 13 is closed.

When the temperature in the thermostat chamber 6, reaches the point at which the thermostat 22, is adapted to operate, the thermostat expands and opens the valve 13, so as to automatically maintain the water in the cylinder jackets at the desired temperature. The connection of the thermostat with the valve may be adjusted by means of the notch 27 in the stem so as to vary the operation of the valve 13, and may thus be regulated to maintain the water at the temperature at which the engine develops its greatest efficiency.

Obviously, as the valve 13, is opened, the valve 15, closes correspondingly and the water from the pump is thus caused to pass more or less through the cylinder jackets according to the amount of opening of the valve 13, and the closing of the valve 15, and when the valve 13, is entirely open the en-

tire output of water from the pump 38, is required to pass through the cylinder jackets.

In order to prevent excessive heating and undue strain on the thermostat 22, in case the temperature of the water in the cylinder jacket should be raised to an abnormal degree, the thermostat is arranged so that when it is extended, the lower disk thereof will seat against the ledge 12, around the opening into the thermostat chamber 6, so as to interrupt communication to the thermostat chamber 8, and prevent exposure of the thermostat to excessive temperatures. This arrangement also serves to provide a stop to prevent movement of the valve 13, by the thermostat beyond the open position.

The thermostat 22, is preferably made of soft metal such as copper or annealed brass, rather than spring metal, the soft metal being more desirable as it lends itself better to the construction of the thermostatic element. The air is exhausted from the interior of the thermostat to such an extent that it is normally collapsed and the sleeve 23, abuts against the plug 24, and holds the valve 13, closed against the tension of the spring 20, and suitable fluid is provided in the thermostat, which at the temperature at which the valve is desired to be opened, expands and permits the spring 20, to pull the valve 13, open to a greater or less extent depending on the degree of expansion of the fluid in the thermostat.

Inasmuch as the extension of the thermostatic element is effected by the tension of the spring 20, and not by the force of the expansion of the fluid in the thermostatic element, a sensitive structure is provided which will yield not only proportionately to the decrease in vacuity in the thermostatic element but the operation is also governed by the tension of the spring used therewith. Moreover, the thermostatic element is not subjected to as great an operating pressure as is required when the element is operated by internal pressure alone or when it operates against the tension of a spring, as in many structures in which thermostatically controlled valves are provided, and there is consequently less danger of the pressure being increased sufficiently to strain or break the walls of the thermostatic element. Therefore, in my construction, the thermostatic element is not only protected from excessive heating by the seating of the lower disk against the ledge 12, which isolates the chamber containing the thermostat from the passages of the valve casing, but it would also require a considerable increase in temperature thereafter to develop a pressure in the thermostat sufficient to strain or endanger the walls thereof.

In a device of this character which is designed to normally close the valve element and prevent circulation, it is advisable that in case of failure of the thermostat to function properly, the valve may be arranged to open so as to prevent overheating of the engine. To this end the illustrated device is, as above noted, preferably made with soft metal walls and collapsed by exhausting the air therefrom and provided with a spring acting against the thermostat to open the valve so that in case the thermostats is impaired as for instance by puncture, the walls of the thermostat will readily yield and permit the spring 20, to move the valve to the open position.

The structure shown in Figure 6, which is in other respects similar to the device of the preceding figure, has a spring 33, connecting the lever 17, and the outer end of the valve 13, and which acts similarly to the spring 20, of the other structure to exert a tension to open the valve 13, and close the valve 15.

The operation is as follows:

When the engine is started and the temperature of the cooling fluid is lower than the temperature that is desired to be maintained in the cylinder jacket, the valves 13 and 15 will occupy the position shown in Figure 2, and prevent discharge of water from the water jacket of the engine and at the same time will permit the pump 38, to circulate the water through the pipe 41, and the open valve 15, and back through radiator, which circulation through the radiator is of benefit, as it permits normal operation of the pump, maintains the water inactive in the cylinder jacket and permits more rapid heating thereof, and also in cold weather prevents freezing of the radiator. Due to the small amount of water contained in the cylinder jacket and its incapability of circulation when the valve 13, is closed, this water soon becomes heated to a high degree and the heat therefrom is communicated by means of the circulation permitted through the pipe 42, to the chamber 7, of the thermostat. When the temperature in the chamber 7, reaches the degree at which the thermostat 22, is designed to operate, the hollow disks thereof, will expand and open the valve 13, and close the valve 15, so as to retard circulation in the pipe 3, and permit circulation through the cylinder jacket, and when the entire volume of water has become heated to some extent, and the engine is running, so as to heat the water in the cylinder jacket sufficiently to maintain the water in the thermostatic chamber 7 at the desired temperature, the valve 13, will remain open, and the valve 15, closed, so that the entire circulation takes place in the cylinder jacket. If, however, the amount of heat given off by the engine is diminished and the temperature of the water reduced, the thermostat will automatically close the valve 13,

sufficiently and open the valve 13, a corresponding amount so as to limit the circulation in the cylinder jacket and prevent cooling below the desired temperature, and by this means, the water in the cylinder jacket is constantly maintained at the temperature desired. When the temperature has reached the point to fully open the valve 13, the lower disk of the thermostat will be seated against the flange 24, so as to close communication between the inlet 2, and the chamber 7, and any temperature in the inlet 2, above the temperature necessary to entirely open the valve 13, will not be communicated to the chamber 7, by reason of this closure, and the thermostat 10, is thereby prevented from excessive expansion and undue strain.

While I have shown my invention in a certain form, I am aware that various changes and modifications may be made without departing from the principles of my invention, and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. The combination of a casing having an inlet and an outlet and a valve therebetween, a thermostat at the inlet side of and connected with the valve for controlling the operation thereof, a by-pass inlet having a valve operable within the aforesaid valve so as to afford communication from the by-pass inlet to said outlet when the first mentioned valve is closed and means extending to the upper portion of the casing for affording limited circulation around the thermostat when said first mentioned valve is closed.

2. In a device of the class described the combination of a radiator, an engine water jacket, an upper conduit connecting the top of the water jacket and the top of the radiator, an inlet pipe connecting the bottom of the water jacket and the bottom of the radiator, a by-pass conduit connecting the upper conduit and the inlet pipe, a main valve in the upper conduit operable by a thermostat to interrupt communication from the top of the water jacket and to the radiator and by-pass, and an auxiliary valve for the by-pass adapted to open when the main valve closes.

3. In a device of the class described the combination of a radiator, an engine water jacket, an upper conduit connecting the top of the water jacket and the top of the radiator, an inlet pipe connecting the bottom of the water jacket and the bottom of the radiator, a pump in the inlet pipe, a by-pass conduit connecting the pump outlet with the upper conduit, a thermostatically operated valve in the upper conduit for interrupting communication from the top of the water jacket to the top of the radiator, and an auxiliary valve for the by-pass adapted to open when the main valve closes.

4. A thermostatic valve fitting having an aperture therethrough with an inlet and an outlet, and a thermostat chamber at the side thereof having a thermostatically controlled opening to the aperture, a valve intermediate of the inlet and outlet, a spring connected with the said valve and exerting a tension to open the valve, and a thermostat in the said thermostat chamber for controlling the operation of the said valve.

5. The combination with a casing having apertured branches connected therewith, of a valve in the aperture, a thermostat in the casing for operating the valve and means in the casing for limiting the movement of the thermostat and preventing damage thereto due to excessively high temperatures.

6. The combination with a casing having apertured branches connected therewith, of a valve in the aperture, a vessel in the casing adapted to expand and contract with changes of temperature, spring controlled operating means connecting the vessel with the valve, and a flange at the junction of the passageway and casing whereby the expansion of the vessel is limited and the entrance to the casing closed when the limit of expansion is reached and said vessel engages the flange.

7. In a thermostatic valve fitting the combination of a pivoted valve, a thermostat, a link pivoted to the valve, a member loosely connected therewith and having a threaded engagement with one end of the thermostat, supporting means at the other end of the thermostat adapted to permit rotation of the thermostat to vary the connection of the threaded member with the other end of the thermostat to regulate the operation of the valve.

8. In a thermostatic valve fitting the combination of the valve, a thermostat having a threaded sleeve at one end and a supporting member at the other end extending outside the fitting and having external means for adjusting the thermostat circularly, a threaded plug engaging the threaded sleeve, a rectangular opening in the plug, and a rectangular stem slidingly engaging the square socket and having the other end thereof pivoted to the valve.

9. In a thermostatic valve fitting the combination of a pivoted valve, a spring exerting a tension to open the valve, a thermostat, a link pivotally connected with the valve and having a sliding connection with one end of the thermostat, and supporting means at the other end of the thermostat.

10. In a thermostatic valve fitting the combination of a valve, a rotatable thermostat, a member having a threaded engagement with one end of the thermostat, a link pivotally connected with the valve and having a sliding relation with the said member and provided with suitable means to hold the

link and threaded member from relative rotary movement, so as to hold the member from rotation with the thermostat.

11. In a thermostatic valve fitting having a passageway and a thermostat chamber at one side of the passageway, the combination of a valve in the passageway adapted to interrupt communication between the thermostat chamber and one end of the passageway, and a circulation duct communicating with said end of the passageway and terminating adjacent the outer wall in the upper portion of the thermostatic chamber.

12. In a thermostatic valve fitting having a passageway and a thermostat chamber extending laterally from and communicating with the passageway, the combination of a thermostatically operated valve in the passageway adapted to interrupt communication between said chamber and one end of the passageway, and a circulation duct communicating with said end of the passageway beyond the valve, and extending outwardly from the passageway to a remote portion of the thermostat chamber so as to maintain circulation in the thermostat chamber when the valve is closed.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

CHARLES L. RAYFIELD.

Witnesses:

EARL M. HARRIS,

CHARLES W. HULL, Jr.

DOCKETED
FILED
60C671
MAY 25 1964
AT ___ O'CLOCK
GILBERT A. WAGNER, JR.
CLERK

Pl. Ex. 32

June 4, 1952

Chris Craft Corporation
Algonac, Michigan

Gentlemen:

Confirming my recent conference with Mr. R. Mack Krebs of your company, I will agree to sell thermostats for installation on your four cycle inboard marine engines for a period of three years from date hereof upon the following conditions:

1. I agree to furnish the Chris Craft Corporation with Holley temperature control system thermostats for the sum of $2.85 each, it being understood that of this sum $1.00 is paid as a royalty for permitting you to build manifold endplate thermostat housings as standard equipment on your engines and the use of the Holley temperature control system and patent No. 2536642. It is understood that you will exclusively use in such housings thermostats furnished by me.

2. It is further understood and agreed that your company is to mark each thermostat housing casting plainly with the words "Holley Temperature Control System, Patent No. 2536642".

3. It is further understood that the Chris Craft Corporation will accept any future improvements to the Holley temperature control system for use in the company's four cycle inboard marine engines and install them, provided the additional cost, if any, can be agreed upon between the company and myself.

4. I further agree that the Chris Craft Corporation shall have the privilege of changing the temperature of thermostats but only when our stock of

thermostats on hand, which is a special order exclusively for Chris Craft, is exhausted. If you will notify me in writing of a desire to change the temperature setting I will at once advise you of the inventory of thermostats on hand and will furnish thermostats with the required setting as soon as the present inventory is exhausted.

5. We further agree that the thermostats to be furnished by us will be and we do hereby warrant them for six months against defective material and workmanship but we reserve the right to have defective thermostats submitted to us for inspection.

6. It is further understood that our agreement is to run for a period of three years at the expiration of which time we will re-negotiate the matter of renewal or extension.

7. That as an original order under our agreement I am to ship you 1,000 thermostats on receipt of your purchase order, and hereafter during the term of this agreement to supply you in accordance with your production schedules such additional thermostats as you may require."

Very truly yours,

HOLLEY MANUFACTURING COMPANY

By